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THE WHEAT CROP FOR 1916.

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I.—RETROSPECT.

Never in our history have the problems associated with the production, marketing, and financing of the Australian wheat crop awakened such lively interest on the part of Governments, politicians, primary producers and consumers. This interest has arisen from the general recognition of the important part played by our staple crop in relation both to Imperial necessities and to home finance.

In 1914, Canada's crop was a partial failure, whilst Australia failed to produce sufficient grain for home requirements. Hence Great Britain was compelled to fill her grain requirements from foreign sources, and send either goods, foreign securities or gold to liquidate the debt.

In 1915, on the other hand, Canada and Australia, thanks to a propitious season, the stimulus of high prices of wheat, and the practical encouragement given to farmers by the respective Governments, seeded a record acreage to wheat and secured the biggest crop on record. This served the twofold purpose of relieving the Mother Country of the embarrassment of dependence on foreign supplies and of assisting the Dominions to meet loan obligations and to restore a favorable trade balance.

In December, 1914, an appeal was made to wheat growers to seed a record acreage in 1915. At the time the appeal was made the pastoral and agricultural industries of Australia were in a most critical condition on account of the drought through which they had just passed.

With both seed and fodder at high prices and labour scarce it seemed somewhat hopeless to advocate large sowings. The outlook, however,

furnished a triple incentive to urge farmers on—

(1) The prospect of good prices for wheat.
(2) The probability of a year of drought being succeeded by a year of abundant winter rainfall.
(3) The necessity of making the crop of 1915 recoup them for the losses of 1914.

The Victorian Government advanced more than £600,000 to cover cost of seed, manure, and fodder to necessitous farmers, and urged farmers to put in as much wheat as possible. The official objective announced early in 1915, was the seeding of an area of 4,000,000 acres and a crop yield of 50,000,000 bushels. At the time of the announcement the general opinion was that the objective, though laudable, could not, in view of the difficulties confronting farmers, be realized.

The response of the farmers was magnificent, no less than 4,160,000 acres being sown to wheat—an increase of 35½ per cent. over the previous year's acreage. Of this area 3,679,971 acres were reaped for grain.

Owing to the favorable season, the abundant and well distributed rainfall, the Victorian harvest amounted to 58,500,000 bushels.

This response of the farmers was beyond praise. At the same time, had it not been for the bold lead given by the State and the liberal advances made—which incidentally strengthened the whole fabric of rural credit throughout the country—this fine result could not have been consummated. It is an interesting example of the manner in which judicious financial assistance accelerates primary production.

A similar appeal was made to farmers by the Governments of all neutral and belligerent countries to increase the acreage sown to wheat; and it is interesting to note that the response in Victoria was relatively greater, both as regards increase in acreage and increase in yield, than that of any other wheat-growing country in the world. Thus the increase in area in Victoria was 28.5 per cent. as compared with 1914, the previous record; and 63 per cent. above the average acreage for the five years prior to the war. Canada showed an increased acreage as compared with 1914 of 26.2 per cent.; Great Britain, 22.5 per cent.; Egypt, 21.6 per cent.; India, 13.2 per cent.; United States, 10.9 per cent. No other countries managed to secure increases in acreage of 10 per cent. save the British Possessions and the United States.

The full details are set out in tabular form in the appendices. The season of 1915 was exceptionally favorable for wheat-growing, and, as a result, Australia's crop will probably exceed 170,000,000 bushels, thus providing an exportable surplus of 135,000,000 to 140,000,000 bushels—a surplus double that of any two previous consecutive seasons. This following on the heels of the most disastrous drought within living memory is a remarkable illustration of the recuperative power of Australian soils.

Long before this bumper harvest was assured problems relating to the marketing and financing of the crop began to exercise the minds of those in authority. In view of the world-wide shortage of freights and the rapidly rising rates for ocean carriage, the State Governments, acting in co-operation with the Commonwealth Government, decided to undertake the responsibility of financing and marketing the crop and making necessary advances to growers. The details of the Wheat-Pooling Scheme are now well known to farmers.

The principle of the scheme is that the proceeds from the sales of wheat, less marketing and transit charges, are to be divided between the participating growers in proportion to the amount of wheat forwarded. Full market price is secured for all cargoes sold abroad, and a fair price, approximating London parity, viz., 4s. 9d. per bushel, is charged for all wheat used for gristing for internal consumption. Such advantageous marketing conditions, it is now generally admitted, could not have been obtained without Government intervention. It may be said that the resources and credit of the States were used on behalf of the producers to obtain full market value for our staple crop.

Summarized, the position for 1915 is as follows:—Victorian farmers reaped a harvest of 58,500,000 bushels, an equivalent of at least two normal crops. In addition, the f.o.b. price is at least equal to the best f.o.b. price received for the past forty years. If the whole harvest could be sold at current rates it would be worth two and a-half to three ordinary crops. Such, in brief, is the record for 1915.

II.—PROSPECT.

But what of 1916? Will the farmers rest content with the achievement of the past season or will they make another concerted effort for a big crop this year? If we are to judge the question by the amount of preparation and fallowing already done, it must be confessed that the crop prospects for 1916 in Victoria are not bright. In the Wimmera, the Mallee, and the Goulburn Valley the amount of fallowing appears to be far short of the amount normally completed at this season of the year. Scarcity of skilled farm labour is having an inevitable effect on diminution of acreage. Since harvest time many farm hands, farmers' sons and farmers themselves have responded to their country's call and have enlisted. This makes the task for those who remain all the heavier.

Though no effort will be spared by those who remain, the task of maintaining the full area under cultivation on each farm will be indeed difficult, and will call for extra sacrifices and hard work.

Except for the greater scarcity of farm labour caused by generous enlistment in this State the task of preparation is not attended with the difficulties that confronted the farmer last year. Stock are in excellent condition, and there is an abundance of fodder on every farm.

But it is to be feared that the general uncertainty regarding the future of the wheat market may cause growers to limit acreages this year, just as anticipated high prices were a powerful stimulus to extra exertions last year. We have read of the bumper crops in the United States, Canada, Australia, and Argentine in 1915, the enormous wheat stacks awaiting shipment to Europe, the general scarcity of freights, the picturesque advance of our Russian allies through Armenia, rumours of Turkey declaring a separate peace; and it is perhaps hard to resist the inference that prices for our staple crop will slump by next harvest. If such a view is widely held by farmers, it will certainly act as a greater deterrent on large acreages than any other factor.

Consequently I have endeavoured in the following pages to summarize the statistical position of the wheat market, with a view of showing that, though the present statistical position may appear adverse to the producer, the future of the wheat market is hopeful.

The statistics, compiled from official sources, are presented in tabular form in the appendices, and they should be of interest to those who, while anxious to form their own opinions regarding possible future developments, do not care to wade through piles of official statistics expressed in the metric system.

First, consider the world harvest for 1915. In 1915 the world reaped its record crop. The magnitude of the harvest in enemy countries is not exactly known, though it is known that the harvest in Germany and Austria in 1915 was a partial failure owing to unfavorable weather conditions prior to harvest.

Reliable authorities agree that the combined crop of Germany and Austria was not more than 80 per cent. of the normal amount. In addition, there was a serious falling-off in the French wheat crop, the production for 1915 being officially estimated at 243,000,000 bushels as compared with a normal production of 317,000,000 bushels for the previous five years, *i.e.*, a shortage of 74,000,000 bushels. Italy, Japan, and Bulgaria also showed decreases in production compared with the normal.

On the other hand, in all other countries there was increased production compared with the average of the five years prior to the war. In all, the wheat reaped was 4,577,000,000 bushels, compared with 3,816,000,000 bushels for 1914, and 3,944,000,000 bushels for the five years' average prior to the war.

The world's previous best record was 1913, when 4,272,000,000 bushels were reaped—that is to say, the world's production for 1915 is 761,000,000 bushels greater than 1914, 633,000,000 more than the five years' average prior to the war, and 305,000,000 more than the previous record crop. The present statistical position, therefore, seems very favorable for consumers and unfavorable for producers. Indeed, if the whole of this enormous surplus were immediately available and could be thrown on the markets of importing countries, a serious slump in prices would be inevitable.

As a matter of fact, however, the Roumanian and Russian surpluses are locked up in the Black Sea ports and cannot, unless peace is declared, affect the markets. Roumania and Russia have between them a surplus of over 300,000,000 bushels. So long as the Dardanelles are closed this surplus cannot affect the market.

Then, again, the scarcity in freights is producing the same effect as a temporary crop shortage in the importing countries, for operators in America, Argentine, and Australia can only effectively offer, and purchasers abroad will only buy, so much of their surplus as they have secured freights for.

In order to more fully appreciate the present statistical position, consider briefly the needs of the importing countries in relation to the surplus available in the exporting countries (these are summarized in Table III. of the appendix). For the five years prior to the war the average import of wheat was approximately 625,000,000 bushels. Of this, Germany and Austria required 80,000,000, the balance being absorbed by the Allies and neutral European Powers. In view of the shortage of production in France for 1915, *i.e.*, 75,000,000, the total requirements of these importing countries (exclusive of Germany and Austria) are 620,000,000 bushels.

In 1915, the exporting countries have a surplus above their home requirements of 1,330,000,000 bushels. Of this surplus Russia, Roumania, and Bulgaria together account for 320,000,000 bushels, leaving approximately 1,010,000,000 bushels for the United States, Canada, Argentine, India, and Australia. Hence the exporting countries, with a surplus of 1,010,000,000 bushels, are competing with one another for a maximum effective demand of 620,000,000 bushels. Under these circumstances, it seems inevitable that there would be a heavy slump in prices on the exporting markets; yet, strange to relate, no such slump has yet occurred, in spite of the fact that the Northern Hemisphere harvest of 1916 will in three months' time be upon us.

As a matter of actual fact the amount of wheat produced by the bumper crop of 1915 is only 305,000,000 bushels more than the record crop of 1913. But more than 310,000,000 bushels are locked up in the Black Sea, and for present market purposes are as good as non-existent. Hence, at the worst, prices should not be lower than those following on the 1913 harvest.

Moreover, evidence is steadily accumulating to show that the prospects for a big world harvest for 1916 are not bright. It is now known that there has been a considerable shrinkage in acreage sown to winter wheat in the Northern Hemisphere this year; and it is more than likely, judging by the unfavorable weather reports, that the average yield per acre in 1916 will not equal that of 1915.

If these speculations are realized, the statistical position will be very much brighter for the producer.

Observed Shrinkages in Acreage.

For example, the official estimates for sowings of winter wheat show a falling off in the United States of 5,000,000 acres, Canada 1,250,000 acres, India 2,000,000 acres—a total falling off in winter wheat alone, in three countries, of 8,250,000 acres. Statistics relating to the spring-sown crop have not yet been published, though reports have been circulated to the effect that the weather conditions have not been favorable for seeding. Assuming a proportionate shrinkage in spring-sown crops, the total area will show a falling off in acreage of, approximately, 11,000,000 acres. Australia and Argentine have not yet (1st April) commenced sowing. So far as Australia is concerned, last year's record increase in acreage was due to the cheap working up of several million acres of crop which failed to mature the previous year. Similar conditions will not prevail this season, and while, of course, we all hope that the acreage sown will be as large as possible, it is almost certain that there will be a shrinkage of at least one to two million acres as compared with last year.

Diminished winter sowings have also been recorded in France, Italy, Great Britain, and Russia. On 15th February it was estimated that the area of winter wheat sown in France this year is 12,500,000 acres, as against 13,606,000 acres last year. Seeding in Great Britain has been delayed, and the area of winter wheat sown is about 94 per cent. of that sown last year.

Reports from Russia indicate that there is a decrease in acreage sown to winter wheat, and that there will be a probable decrease in spring

sowings in 1916. No definite figures as to acreage sown are available, but as the normal area sown in Russia is 75,000,000 acres, any serious falling off in acreage would lead to a great diminution in yield.

Weather conditions in Italy have been unfavorable for extended sowings, and a diminished acreage is expected.

So far as the Southern Hemisphere is concerned, it is unlikely, unless wheat prices rise suddenly, and unless unusual stimulation is given by Governmental agencies, that the acreage sown in Australia will approach that of last year. It is too early yet to forecast the probable seeding in the Argentine, as seeding has just commenced.

Summing up the prospects for acreage, we may say that, so far as we can see at present, it is certain that there will be a considerable diminution in the acreage sown to wheat this year, and the final figures may utimately show a deficit of 15,000,000 acres as compared with last year. This, under normal conditions of yield, will give a diminished outturn of 240,000,000 bushels.

DIMINUTION IN AVERAGE YIELD.

Of equal effect in reducing the surplus would be the possible decrease in the average yield per acre in the wheat-growing countries of the world. The American crop of 1915 averaged 16.9 bushels per acre with, approximately, 60,000,000 acres sown to wheat. This was the highest average yield per acre secured by America for *30* years. The average yield for the 30 years prior to the war was 13.8 bushels per acre.

It is very unlikely that the weather conditions in America throughout the wheat-growing period would again be favorable for another bumper crop.

A survey of past records shows wide fluctuations in the average yield, varying from 12.5 bushels per acre in 1904 to 16.9 bushels per acre in 1915.

Already there are indications that there will be a considerable reduction in the average yield this year. Thus the official report for April by the Washington Agricultural Bureau states that the condition of winter wheat on 1st April was 78.3 per cent.—the worst on record. This indicates a probable yield of 14½ bushels per acre, equivalent to a total production of winter wheat of 495,000,000 bushels, as against *659,000,000* bushels of winter wheat last year—a reduction of *164,000,000* bushels.

It might be expected that the Canadian crop prospects would follow more or less closely those of America, since the principal wheat belts of each country experiences similar climatic conditions. In this case, there would be a considerable diminution in 1916.

On 10th March, the second official forecast of the Indian wheat crop was issued. The revised estimate shows that there is a shrinkage in acreage under crop of 1,807,000 acres, or nearly 6 per cent., compared with the previous year. It states that the failure of the winter rains in December and January seriously affected the crop, particularly in the un-irrigated areas in the Punjab, United Provinces, and the Bombay Presidency. The February rains, however, materially benefited the crop.

By the time this article is published, the crop estimate will probably have been issued, but present indications certainly point to a diminished output from India this season.

So far as Europe is concerned, it is difficult to secure exact information either as to acreage or the prospects of the 1916 crop. Judging by reports already received, it appears that the general condition of the winter-sown wheat is not as favorable as last year.

The cereal year of 1915 was the best on record in the history of the world, both in point of total acreage, total production, and total yield per acre.

A reduction of a bushel per acre in the average yield would mean a diminution in the aggregate production of 240,000,000 bushels. A reduction of 2 bushels per acre would more than wipe out last year's surplus.

In spite of the excessive cost of ocean freight, and the huge surpluses available for shipment, prices have remained at a satisfactory level in the exporting markets of the world, and are at present considerably in excess of pre-war prices. This may be seen in Table VI. of the *appendix*. *Thus in Chicago the price of wheat in July, 1914, just prior* to the war, was 3s. 4½d. per bushel. Since the war the lowest market price was 4s. 4½d. in November, 1915. It is now (15th April) 4s. 11d. per bushel.

If the war continues, the prices for wheat must remain at a profitable level in the exporting countries, otherwise there would be a diminished production, followed by an immediate and substantial rise in values.

The belligerents, who are now mobilizing all their available man power for military service, will find it increasingly difficult to keep up their full agricultural production, and must rely more and more on the exporting countries to feed their teeming millions. This more particularly applies to France, Italy, and Great Britain.

On the other hand, even if peace were declared, there is historical evidence to show that prices of wheat would remain at a high level for a considerable period, since belligerents invariably concentrate their energy and depleted capital to re-establishing their industries, repairing roads, railways, bridges, and factories, and developing their manufactures, rather than accelerating the volume of agricultural production.

In such a case, Germany and Austria, devastated Poland and Belgium, inured for nearly two years to restricted supplies of food-stuffs, would absorb a considerable portion of Russian surplus awaiting shipment at Black Sea ports.

Summing up the whole situation, we may say the prospects for a continuance of satisfactory prices is favorable.

The surplus of last year is threatened with extinction by the anticipated deficiency of this year.

Present indications point to a diminished outturn of wheat in 1916 owing to two causes—(*a*) shrinkage in acreage sown, and (*b*) decreased averages per acre due to unfavorable weather conditions.

The shrinkage in acreage in the Northern Hemisphere (where over 90 per cent. of the world's wheat is grown) will probably amount to 15,000,000 acres, involving a diminished outturn of 240,000,000 bushels.

The decreased return per acre, caused by unfavorable weather, will certainly amount to a bushel per acre, involving a diminished output of 240,000,000, *e.g.*, a total of at least 480,000,00 bushels.

III.—THE FARMERS' WORK FOR 1916.

The farmers of the State are advised to carefully watch the cables respecting the international wheat position during the next few weeks, with a view of confirming the extent of the diminished acreage in the Northern Hemisphere and diminished outturn per acre.

I have endeavoured to show that the statistical position hitherto markedly in favour of consumers of wheat, on account of the bumper crops and record surpluses, may be expected to gradually turn in favour of producers of wheat.

Even if pre-war prices only were expected, there is still the obligation on every farmer in the Empire to produce the maximum food-stuffs possible. Major-General Sir William Otter, in a message to the Canadian people, said, "Above all, measures should be taken to stimulate the production of food-stuffs. One of the greatest services which the Canadian people can render to the Empire is to increase our supply of food for the British people. This is at once our duty and our opportunity."

Australia's expenditure for the current financial year will amount to £73,000,000, more than half of which is loan money spent on defence. The loan expenditure must increase during the currency of the war, and with it the obligation of finding money to pay interest on the loan. In a country such as Australia, almost entirely dependent on primary production, the best way of meeting our constantly increasing obligations, and of maintaining a favorable trade balance, is to accelerate the volume of agricultural production and increase our exports of wool and wheat, butter, and meat. This can be done only by increasing the acreage under cultivation and in applying the utmost skill to secure the maximum return per acre.

Increased acreage on existing farms can now be secured by working all the team strength and all the man strength on the farm and the largest and most effective implements for the fullest available period every day. Mr. W. H. Hearst, Premier of Ontario, Canada, said in an address at Toronto, "The farmer at work in the field is doing as much in this crisis as the man who goes to the front."

Our farmers and farm hands should fully realize that by making sacrifices and working hard in the fields they are doing their bit towards ultimate Allied victory, which is to be won as much by producing an abundance of food-stuffs as by supplying freely men and munitions.

As regards the other factor—securing the maximum yield per acre—the essential factors for securing heavy wheat crops have been dealt with in considerable detail in past issues of this Journal, and were referred to in "Seeding Notes" issued in April, 1915.

Finally, we are experiencing difficulties by reason of our distance from the world's markets in providing freight for our products, and especially for our surplus wheat of 1915. It is probable that a considerable amount of wheat may be still unshipped by next harvest. Even so the financing of the crop should not prove an insuperable difficulty to a country with the resources of Australia. Our farmers have demonstrated that, when appealed to, they can produce an abundance of wheat. It should not be beyond the resources of the Commonwealth to find means for financing the crop.

APPENDIX.

A series of tables are given in this appendix covering information on—

1. The acreage sown to wheat in 1915 and 1914 in each of the principal wheat-growing countries of the world.
2. The production of wheat for 1914 and 1915, compared with the average production for the five years prior to the war, in the wheat-growing countries of the world.
3. Statistics of exports and imports of wheat for the five years prior to the war, and a statement of wheat available for export in the exporting countries compared with the requirements of the importing countries for season 1915-16.
4. The prices of wheat in importing and exporting countries for the decade prior to the war and the fluctuations in prices during the war.
5. The prices of freights for the five years prior to the war and the fluctuations that have taken place since.

The tables have been compiled from official statistics issued by the International Institute of Agriculture, Rome.

TABLE I.

SHOWING THE ACREAGE UNDER WHEAT IN 1914 AND 1915, AND THE PERCENTAGE INCREASE IN AREA IN 1915.

Country.	Area Sown, 1915.	Area Sown, 1914.	Percentage Increase in Area 1915 compared with 1914.
Victoria*	3,679,971	2,863,535	+ 28·5
Canada	13,138,000	10,414,000	+ 26·2
Australia †	11,984,971	9,651,081	+ 24·2
Great Britain	1,927,000	2,360,000	− 22·5
Egypt	1,600,000	1,316,000	+ 21·6
India	32,607,000	28,797,000	+ 13·2
United States	60,113,000	54,167,000	+ 10·9
Argentina	16,612,000	15,650,000	+ 6·1
Italy	12,648,000	11,921,000	+ 6·1
Russia .. { Europe	65,376,000	62,631,000	+ 4·4
{ Asia ..	14,702,000	14,415,000	+ 2·0
Spain	10,060,000	9,794,000	+ 2·7
Japan	1,189,000	1,187,000	+ 0·2
Algeria	3,246,000	3,407,000	− 4·7
France	14,279,000	15,150,000	− 6·1
Roumania	4,760,000	5,279,000	− 9·8

* Figures given in final estimate of Victorian Statist.
† Figures supplied by Commonwealth Statist.

This table summarizes the acreage sown to wheat in 1915—the first wheat season after the outbreak of war—as compared with the acreage under crop the season immediately prior to the war.

The Northern Hemisphere was busy gathering the 1914 crop when war was declared.

This table presents several interesting features. It will be noted that, in spite of the stimulus of anticipated high prices of wheat and

the admitted necessity of producing as much wheat as possible, there was no material increase in acreage in the more important wheat-growing countries, except in British Possessions and the United States.

Victoria led the way with an increase of 28.5 per cent. over the 1914 acreage. Then followed Canada (26.2 per cent.), Australia (24.2 per cent.), Great Britain (22.5 per cent.), Egypt (21.6 per cent.), India (13.2 per cent.), and United States (10.9 per cent.).

Argentina (6.1 per cent.), Italy (6.1 per cent.), Russia (2 to 4 per cent.), Spain (2.7 per cent.) also showed slight increases; whilst France (—6.1 per cent.), Algeria (—4.7 per cent.), and Roumania (—9.8 per cent.) showed reductions in acreage.

TABLE II.

TOTAL WORLD PRODUCTION OF WHEAT, 1914-1915, COMPARED WITH AVERAGE PRODUCTION FOR FIVE YEARS PRIOR TO THE WAR.

Country.	Average Production for five years, 1910–14.	Production, 1914.	Production, 1915.	Percentage Increase in 1915 compared with Average Yield for five years, 1909–14.
				(1909-14 = 100%)
	Millions of Bushels.			%
United States	727·2	888·8	1011·5	138
Russia	721·8	751·6	907·5	125
India	356·7	311·5	382·7	107
France	309·3	282·2	237·4	77
Canada	199·3	161·1	335·8	171
Italy	179·2	169·1	170·3	95
Hungary	182·0	105·0	151·1	84
Argentine	156·2	168·5	184·1	118
Spain	124·8	116·0	143·8	116
Roumania	85·2	46·1	89·5	105
Australia	**77·4**	**24·8**	**175·0**	**227**
Great Britain ..	59·5	62·1	71·1	127
Bulgaria	48·4	29·3	46·2	95
Algeria	34·8	34·8	34·5	99
Egypt	34·5	32·6	39·3	113
Japan	24·8	21·6	23·5	98
Holland	5·1	5·5	5·5	110
Denmark	5·8	5·8	8·1	139
Tunis	5·5	2·2	11·0	200
Germany	153·4	145·7*	124·8*	80
Austria	61·3	61·3*	47·7*	80
Belgium	11·6	13·9*	11·0*	75
Countries which do not contribute official statistics	377·6	371·4	367·0	
Grand Total ..	**3944·1**	**3816·8**	**4577·5**	**116**

* Estimated.

NOTES ON TABLE II.

This gives a summary of the production of wheat for each country of the world for the five years prior to the war, and also for each of the

years 1914 and 1915. A perusal of the table will show at a glance the remarkable increases in production in 1915 as compared with the five years prior to the war.

Australia easily led the way in percentage increase in production, for in 1915 she secured a total yield of 175 million bushels as compared with 77.4 million bushels for the five years prior to the war nearly two and a half times the size of a normal crop. This was the record crop in her history. No other country, except Tunis, which had a relatively small area under crop, approached this increase in yield.

Canada had a remarkably good crop—her yield being 335 million bushels as compared with a normal production of 199 million bushels. Like Australia, she secured her record crop in 1915.

The greatest increase in actual volume was obtained by the United States and Russia. The American crop exceeded 1,000 million bushels—the record crop of any country and of any time. The increase was no less than 284 million bushels greater than her pre-war average. Russia, notwithstanding her active participation in the war, increased her production by 186 million bushels compared with pre-war production—a remarkable testimony of her wealth in human resources. As with America, Canada, and Australia, the 1915 crop was a record one for Russia.

Other countries showing substantial increases were Great Britain, Argentina, Egypt, Spain, and India.

On the other hand, there has been a shrinkage in yield in Japan, Bulgaria, Italy, Hungary, and France. The greatest shortage was observed in France, the production for 1915 being 72 million bushels less than the normal output in peace times. This was partly due to a falling off in area, but chiefly to a lesser yield per acre—one of the inevitable results of the mobilization of skilled farm workers of military age.

It is difficult to secure reliable information regarding wheat production in Germany and Austria. It is known that the harvest weather was very unfavorable, and that the yield was considerably less than the normal. In Hungary, the official estimate of production was 151 million bushels, a falling off of 31 million bushels compared with the normal yield. This represents a yield of 84 per cent. of the average.

It is estimated that the total yield of Germany and Austria is certainly less than Hungary, and would probably not exceed 80 per cent. of the normal yield, which would mean a deficiency compared with the pre-war period of 29 million bushels for Germany and 14½ million bushels for Austria.

Summing up, the total yield for the world for 1915 *is* 4,577 *million bushels as compared with* 3,816 *millions for* 1914, *and* 3,944 *millions for the pre war period—an increase of* 761 *and* 633 *million bushels respectively. The previous world record harvest was obtained in* 1913, *when* 4,272 *million bushels were reaped.*

Tables III. and IV. show the probable demand and supply of wheat in the world for the year ending July, 1916. To find the probable demand, or the quantity requiring to be imported by the importing countries, we have to find out (1) the normal consumption in these countries, and (2) subtract from this their own production for 1915.

TABLE III.

STATEMENT OF PROBABLE DEMAND AND SUPPLY OF WHEAT FOR YEAR ENDING JULY, 1916.

DEMAND.

Importing Countries.

Country.	1. Production average for 5 years ending Feby., 1914.	2. Average net imports of wheat for 5 years prior to war.	3. Total average requirements prior to war.	4. Estimated production Season 1915.	5. Requirement from abroad for year ending July, 1916.
	Millions of Bushels.				
Great Britain ..	59·4	216·0	275·4	74·1	201·3
France	317·0	43·6	360·8	237·4	123·4
Italy	186·9	53·2	240	170·3	69·8
Spain	130·2	6·2	136·4	143·8	— 7·3
Egypt	34·8	8·1	43·0	39·3	3·6
Japan	24·2	4·0	28·2	23·5	4·7
Holland	4·7	22·0	26·7	5·5	21·2
Denmark	4·7	6·2	11·0	8·1	2·9
Norway	·37	3·6	4·0	·3	3·6
Germany	152·0	68·3	220·3	124·9*	95·5*
Austria	232·0	10·6	242·6	198·0*	44·6*
Belgium	14·7	49·2	63·8	11·0*	52·8*
Sweden	8·1	6·9	15·0	8·1	6·9
Switzerland ..	3·3	16·8	20·1	4·0	16·1
Tunis	5·9	·7	6·6	11·0	- 4·4
Countries which do not supply official statistics ..	377·6	110·1	110·1	367·0	120·7
Totals ..	1555·5	625·5	2181·0	1426·3	754·7

* Estimated.

TABLE IV.

SUPPLY.

Exporting Countries.

Country.	Average production for 5 years ending Feby., 1914.	Average net export of wheat and flour for 5 years prior to war.	Total average consumption.	Estimated crop for 1915.	Amount available for export (surplus).
	Millions of Bushels.				
Russia	817·3	164	653·3	907·5	254·2
United States ..	685	106·8	578·2	1011·5	133·5
India	350	49·5	300·5	382·7	82·7
Canada	197	94·6	102·4	335·8	233·4
Argentine	148·6	82·5	66·1	184·1	118·0
Roumania	87·8	53·6	34·2	89·5	55·4
Australia	90·7	53·2	37·4	175·0	137·6
Bulgaria	45·5	10·6	34·8	46·2	11·4
Algeria	31·8	5·5	29·4	34·5	5·1
Chili	19·4	1·8	17·6		
New Zealand ..	7·3	·7	6·6		
Totals of Exporting Countries ..	2484·6	623·0	1861·6	3151·2	1330·6

Similarly, to find the probable supply, or surplus available for export in exporting countries, we have to set out (1) the total production of these countries for the year 1915 and (2) deduct the estimated home requirements of the exporting countries.

In order to avoid fluctuations, it is best to estimate the normal requirements of each country on the basis of the five years' average prior to the war. These are summarized in Tables III. and IV.

In Table III. it will be seen that the importing countries of the world required annually, prior to the war, approximately 625 million bushels of wheat. For the year ending July, 1916, assuming a consumption equal to normal times, they would require 744 million bushels. But under war conditions it might be expected that these requirements would be modified.

Prior to the war the population of the importing countries was steadily increasing, and they were prosperous, consequently the requirements were increasing year by year. On the other hand, the high price of wheat in the importing countries during the war and the diminished income of the people would tend to economy in the consumption of wheat. The actual requirements for the year 1915, however, were almost equal to the average requirements for the five years prior to the war. Hence we may take the estimated requirements for 1916, in column 5, as approximately correct.

Of the 754 million bushels required for 1916, no less than 193 million bushels are required for Germany, Austria, and Belgium. Assuming the blockade is effective, this amount, less perhaps the quantity required to feed the needy Belgians, may be deducted from the total demand. This would leave from 561 to 614 million bushels as the probable effective demand in allied and neutral importing countries for the year ending July, 1916.

On the other hand, the exporting countries have available for shipment no less than 1,330 million bushels. Of this, the Russian and Roumanian surplus, amounting to 310 million bushels, is securely locked up in the Black Sea. So long as the Dardanelles are closed, this crop cannot be utilized to relieve the importing countries, and may be ignored in determining the present effective supply. Moreover, Bulgaria's surplus of 11½ million bushels must be deducted. This leaves, approximately, 1,010 million bushels surplus available for export in the United States, Canada, Argentina, India, and Australia. That is to say, excluding, on the one hand, the requirements of enemy countries, and, on the other hand, the available supplies of Russia and Roumania, we have a surplus equivalent to 1,010 million bushels competing for an effective demand of from 561 to 614 million bushels.

The statistical position is therefore eminently favorable for consumers of wheat, and equally unfavorable for wheat producers. In view of the heavy surpluses available for export, one would have expected a serious fall in wheat values since last harvest, especially in the exporting markets.

Table VI. gives a summary of the monthly quotation for wheat in London, Genoa, Winnipeg, Chicago, and Buenos Ayres for the year 1915. The prices are taken approximately at the middle of the month. It will be seen that there was a considerable decline in value in June, 1915, when the prospects for a big harvest were assured, but that prices have been well maintained since. In spite of scarcity of freight and the immense surplus, the level of prices in the exporting countries is considerably higher than it was at the outbreak of war. It must be

remembered that the prices of wheat in Chicago and Winnipeg are below the f.o.b. American prices. Chicago is over 1,000 miles inland from New York, and Winnipeg about 1,750 miles from Montreal.

The prices at the Chicago and Winnipeg markets correspond approximately to the prices the farmers of the United States and Canada obtain for their wheat.

TABLE V.

AVERAGE PRICES OF WHEAT PER BUSHEL FOR CALENDAR YEAR IN IMPORTING AND EXPORTING COUNTRIES FOR THE TEN YEARS PRIOR TO THE WAR

	IMPORTING COUNTRIES.				EXPORTING COUNTRIES.			
	United Kingdom.	France (Paris).	Italy.	Germany (Berlin).	Russia (Odessa), Red Winter.	United States.	Canada, No. 1 Northern.	Australia (Melbourne).
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1905 ..	3 11	5 1½	5 8¼	4 8½	3 7½	4 2½	3 9	3 5½
1906 ..	3 9½	5 1½	5 5½	4 10½	3 4½	3 3½	3 2	3 3½
1907 ..	4 2	6 6½	5 8	5 6¾	4 1	3 9½	3 8	3 9½
1908 ..	4 6½	4 11½	6 4½	5 8½	4 8½	4 1	4 3½	4 2½
1909 ..	5 0½	5 3½	6 8½	6 3½	4 8½	4 11½	4 6½	4 7½
1910 ..	4 6½	5 8½	6 2½	5 8½	3 11½	4 6½	3 11½	3 10½
1911 ..	4 3½	5 8½	6 0½	5 6	3 10½	4 0½	3 11½	3 6½
1912 ..	4 7½	6 3½	6 9½	5 10½	4 3½	4 4½	4 1	4 1½
1913 ..	4 5½	6 0½	6 1½	5 4½	4 0	3 11½	3 8	3 8½
1914 ..	5 0	..	6 4	..	..	4 3½	4 1½	..
Average of 10 years per bushel	4 5	5 6½	6 2	5 6½	4 1	4 2	3 11½	3 10

These figures, abstracted from the *Statistical Annual*, Rome, give the average prices of wheat in four typical importing countries and four typical exporting countries for the decade prior to the war.

These figures are not strictly comparable, because they refer, of course, to somewhat different qualities of wheat. The Melbourne prices for Australian wheat, for example, are slightly above the London parity of the bulk of imported wheat. They are, however, representative of the bulk of the wheat sold at the ports referred to.

It will be seen that the average price of imported wheat in Great Britain for the ten years prior to the war was 4s. 5d. per bushel, and the price in Paris Rome, and Berlin was, approximately this price plus the import duty (Germany, 1s. 6d. per bushel; France, 1s. 6½d. per bushel; and Italy, 1s. 7½d. per bushel).

That is to say, the exporting countries might expect to get for wheat shipped to Europe about 4s. 5d. *per bushel at the port of delivery, and that the price of wheat in Europe was this price plus an addition equal to the import duty.*

The prices in the exporting countries were, as might have been expected, roughly, equal to this price less the cost of ocean carriage, and that the price would vary with the distance of the exporting port from the world's markets. A feature of interest is the way in which prices are levelled in normal times in different countries by the low cost of freight.

Table VI.

Table Showing Fluctuations in Price of Wheat during the War.

	Importing Countries.		Exporting Countries.		
	London.	Genoa.	Winnipeg.	Chicago.	Buenos Ayres.
	per bushel.	per bushel.	per bushel.	per bushel.	per bushel.
1914.	s. d.	s. d.	s. d.	s. d.	s. d.
July	4 5¼	5 8¼	3 7½	2 4½	2 1½
1915.					
January ..	6 11½	8 9½	5 8	5 11½	5 2¼
February ..	7 9¾	9 0¼	6 2½	6 6	5 8
March	8 2¼	9 9½	6 1	6 7½	5 9½
April	8 3½	9 8	6 0¾	6 5½	5 11½
May	8 6¼	9 8	6 7¾	6 5½	6 1¼
June	6 11½	8 2¼	4 11½	5 0½	5 5¼
July	6 8½	7 11½	5 7½	5 8½	5 6¾
August ..	7 1¾	8 10	5 2½	4 10½	5 5½
September ..	7 1¾	8 5½	3 11¼	4 6¾	5 4½
October ..	7 4¾	9 1¼	4 2¼	4 9¾	5 6½
November ..	7 4½	9 1¼	4 1½	4 4½	5 2½
December ..	7 5	9 6	4 1½	4 6½	..
1916.					
April 15th ..	8 1	..	..	4 11	..

According to the system used by the institute, the prices are the actual prices in each country calculated at the par rate of exchange. This is accurate enough in ordinary times, but the rates of exchange have fluctuated considerably during the currency of the war, and it is necessary to take this into account when comparing prices of one country with another. The rate of exchange on London on 11th December, 1915, was as follows:—Paris, – 9 per cent.; Italy, – 19 per cent.; New York, + 3 per cent.

Table VII.

Fluctuations in Ocean Freights to Liverpool prior to the War.

(Per bushel.)

	United States (New York).	Russia (Odessa).	Argentina (Bahia Blanca).	India (Bombay).	Australia (Melbourne-Sailer).	United States (North Pacific).
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1909	0 1¼	0 2½	0 2½	0 4½	0 7	0 7½
1910	0 1½	0 2¾	0 3¼	0 4½	0 7	0 7½
1911	0 2¾	0 3	0 3¼	0 5	0 8	0 7½
1912	0 3¾	0 4	0 7	0 6¾	0 9¾	0 10
1913	0 2¾	0 3	0 6¼	0 5½	0 10	1 0½
Average 5 years (per bushel) ..	0 2¾	0 3	0 4½	0 5¼	0 8⅝	0 9½
Shillings per ton ..	7 6	9 3	14 3	16 6	26 2	28 2

Prior to the war the average price of freight from the principal exporting countries was as follows:—

New York	7s. 6d.	per ton
	$2\frac{3}{4}$d.	per bushel
Odessa	9s. 3d.	per ton
	3d.	per bushel
Argentina	14s. 3d.	per ton
	$4\frac{3}{8}$d.	per bushel
India	16s. 6d.	per ton
	$5\frac{1}{4}$d.	per bushel
Australia (Sailer)	26s. 2d.	per ton
	$8\frac{3}{8}$d.	per bushel
Pacific Coast	28s. 2d.	per ton
	$9\frac{1}{8}$d.	per bushel

TABLE VIII.

FLUCTUATIONS IN PRICES OF FREIGHTS DURING WAR PERIOD.

	New York.				Bombay.				Argentine.				Australia (Sailer).			
	Shillings per ton.		Price per bushel.		Shillings per ton.		Price per bushel.		Shillings per ton.		Price per bushel.		Shillings per ton.		Price per bushel.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Average of 5 years ending 1913	7	6	0	$2\frac{3}{4}$	16	7	0	$5\frac{3}{8}$	13	0	0	$1\frac{1}{4}$	26	2	0	$8\frac{3}{8}$
1914.																
July ..	8	0	0	$2\frac{5}{8}$	12	0	0	4	10	6	0	$3\frac{1}{2}$	..		..	
1915.																
January ..	31	4	0	$10\frac{1}{4}$	32	6	0	$10\frac{1}{4}$	62	6	1	8	No Export			
August ..	31	3	0	10	46	0	1	$2\frac{3}{4}$	62	6	1	8	,,		,,	
September ..	40	8	1	$1\frac{1}{4}$	42	6	1	$1\frac{3}{8}$	60	9	1	$7\frac{1}{4}$	,,		,,	
October ..	62	5	1	8	42	6	1	$1\frac{3}{8}$	65	0	1	9	62	6	1	8
November ..	62	5	1	8	60	0	1	$7\frac{1}{4}$	85	0	2	$3\frac{1}{2}$	70	0	1	$10\frac{1}{2}$
December ..	59	4	1	7	70	0	1	$10\frac{1}{2}$	112	6	3	0	75	0	2	0
1916.																
January ..	62	5	1	8	105	0	2	$9\frac{3}{4}$	140	0	3	9	75	0	2	0

The above table summarizes the price of freights to Liverpool from New York, Bombay, Argentine, Australia, for certain periods during the war.

It will be noticed that compared with rates for preceding five years freight was cheaper at the outbreak of war than it had been for many years past. The cost of freight has risen enormously during the war period, especially in the Argentine, where freights for January, 1916, were 140s. per ton, or 3s. 9d. per bushel, as compared with 10s. 6d. per ton, or $3\frac{1}{2}$d. per bushel, immediately before the war.

The Australian freights were chartered by the Commonwealth Government, but there was very limited freights at the figure officially announced for sailers (75s. per ton). Steamer freights from Australia on January were 105s. per ton (2s. 9d. per bushel), and have risen to

the neighbourhood of 140s. per ton (3s. 9d. per bushel), and are difficult to secure even at that price.

Taking the freights as they are in the table, it will be seen that in eighteen months they have risen from ten to fifteen times their normal value. This remarkable rise is chiefly due to the heavy requisitioning of the allied mercantile marine for the transport of men, foodstuffs, and munitions for the allied Governments.

SUMMARY.

1. The Victorian wheat-growers, in response to the appeal for increased sowings of wheat last year established two world records.

2. The increase in area was 28½ per cent. greater than the previous year—itself a record—and 63 per cent. greater than the average of five years prior to the war.

3. No other wheat-growing country of equal output gave such an increase in acreage.

4. The yield was 58½ million bushels, compared with an average yield of 23½ million bushels for the 5 previous years—an increase of 150 per cent. This increase, as compared with the normal output, also constitutes a world's record.

5. The present f.o.b. price is the best export price secured for 40 years, and if the whole harvest could be sold at current rates it would represent in money value three normal crops.

6. The prospects for a big acreage for 1916, however, are not bright, as the area in preparation for wheat is apparently much less than normal years.

7. Scarcity of farm labour, and lack of substantial autumn rains in the wheat areas are partly responsible for the probable reduction in acreage.

8. An important factor, however, is the general uncertainty among farmers as to probable prices for wheat for next year.

9. The foregoing paper attempts to show that, though the present statistical position is favorable for wheat consumers, there is reason to believe that by next harvest it will gradually turn in favour of the producer.

10. The world reaped its record crop—4,577 million bushels—in 1915.

11. The exporting countries have a surplus for export of 1,320 million bushels for the year ending July, 1916.

12. Of this 310 million bushels are locked up in Russia and Roumania, leaving 1,010 million bushels awaiting export in America, Canada, Argentina, India, and Australia.

13. The importing countries (excluding enemy countries) require 561 million bushels, hence there is a surplus above requirements of 449 million bushels.

14. There are two factors in the present world outlook for wheat that growers are advised to carefully watch—(*a*) diminution in acreage in other countries, (*b*) reduction in average yield per acre as compared with last year.

15. The shrinkage in world acreage for the current year would probably exceed 15 million acres, involving a lessened production of 240 million bushels.

16. In view of the unfavorable weather reports in Europe, India and America, the average yield per acre for the coming crop would in all probability be much less than last year.

A shrinkage of one bushel per acre would mean a diminution of 240 million bushels. The diminution in the winter wheat yield in the United States this year is estimated to be 164 million bushels.

17. Thus the statistical position may be expected to turn gradually in favour of producers of wheat.

18. If the war continues for some time the demand for wheat must increase, and prices must remain at a profitable level in the exporting wheat countries.

19. If peace is declared, historical evidence shows there is a probability of high prices for some years after the termination of the war.

20. To maintain a favorable trade balance and provide interest on our ever increasing loan obligations, Australia must accelerate her agricultural production and increase her exports of wool and wheat, butter and meat.

21. Our farmers have demonstrated that when appealed to they can produce wheat.

It should not be beyond the resources of the Commonwealth to find the means for financing the crop.

SPINACH AS A MEDICINAL VEGETABLE.

All varieties of spinach are good food products. It has recently become known that spinach contains two kinds of saponine, a substance which is regarded as having a clearing action on the lungs and respiratory passages, a fact which may become of considerable interest to persons suffering from lung troubles.

By spinach is meant the ordinary garden vegetable, which the botanists call *Spinacia oleracea*.

In preparing spinach fresh from the garden for table use, it should be freed from the seed pods as much as possible, and washed under flowing water in a colander. It may be finely chopped, placed in a pot without any water, put on the fire and cooked. This is possible because nine-tenths of the weight of the substance is water. By proceeding in this way one will obtain a very well-flavoured and very satisfactory vegetable from which nothing whatever is lost.

The method generally used of scalding the spinach, and then throwing away the blanching water has been objected to by dietitians and food chemists for twenty years.

Repeated chemical analyses prove that 20 per cent. of the fat, 5 per cent. starch, 26 per cent. sugar, 32 per cent. lime, 74 per cent. magnesia, and 63 per cent. of the phosphoric acid is lost in the blanching process.

Jürgensen says the throwing away of the blanching water is as nonsensical as would be the throwing away of beef broth.

Among the varieties mentioned are Giant Catillon, Long Leaf Winter, Yellow Swiss, Gandry, Goliath, Flemish, Ideal, Viroflay, Giant Shimose, Triumph, and Victoria.—[Extracts from article in *Pure Products*, November, 1914.]

PICKLING WHEAT.

By H. A. Mullett, B.Ag.Sc., Science Cadet.

That Ball-Smut or Bunt can be prevented in the wheat crop by the intelligent use of a proper pickle is so well known that a repetition of the fact sounds trite; yet in every farming community there are always *some men who are docked from 1d. to 3d. a bushel for smutty wheat*, and a great many more experience certain misgivings when they notice the wheat buyer carefully poking his sampler just up along the inside of the bag.

Besides this near-sighted view of direct loss to the individual grower, there is a much broader question, and it concerns the national efficiency. As a wheat exporting country, our wheat comes into competition with that from all parts of the globe, and although Australian wheat has stamped itself as second to none for flour production, yet we have great handicaps, such as distance from the markets and the vagueness of the seasons, that make it criminal to neglect any preventable cause of loss, however small it may seem to the individual.

Every farmer makes it his business to reserve his seed from the cleanest and best of his crop, and the systematic pickling of this apparently clean seed is routine practice, so that the cause of failures and partial failures can only be ascribed to a lack of proper understanding of the scientific facts, and to the use of obsolete methods.

The standard pickles, viz., 1½ per cent. bluestone (1½ lbs. in 10 gallons of water) and 1 lb. formalin in 45 gallons water, with immersion for five minutes, have proved very successful when used for normal seeding conditions, but farmers, for economic reasons, are often forced to depart from regular methods, and it is here especially that a working knowledge of the principles involved becomes essential.

Principles Involved.

Briefly, to enumerate, first, the characteristics of the disease; and, secondly, those concerning the action of the pickle, they are:—

(1) That ball-smut or bunt is a fungus disease, propagated by means of tiny seeds or spores, and that almost the only means of infection of a wheat crop is by the sowing of untreated spores in actual contact with grain. Each ball of smut contains enough of these spores to infect every grain in a bushel of wheat four or five times over, and when it is considered that these balls when unbroken are impervious to the pickle, it will be seen that any treatment of the smutty seed may be risky business if these are not eliminated.

(2) Bluestone and formalin act mainly as contact poisons, and the brush of the wheat grain where the spores readily collect are particularly difficult to wet. The effect of the pickle is not limited to the spores alone, but it also

depresses the germination of the grain, and subsequent growth for a time is lower than normal. This effect on the germination increases with the strength of the pickle, so that care must be taken to make up pickling solutions in a definite manner, or germination may be unduly interfered with, while on the other hand too weak a solution will not kill the spores.

The standard pickles mentioned above will be found satisfactory in these respects, but if for any reason an increased strength is necessary, it should be automatically followed by a heavier rate of seeding; while for late sowing, where a quick germination is required, or where weeds are bad, the strength may be reduced with advantage to rapid growth.

BLUESTONE OR FORMALIN.

There has been considerable controversy as to whether formalin or bluestone is the better. Formalin pickling is generally recognised as easy and quick to work with, and its use is very general where apparently clean seed is to be sown within a week or two after pickling; but if grain so pickled is allowed to stand for longer than that time, or sown under "dry" conditions, the seed coat becomes tough and germination may be faulty.

With bluestone there is no such toughening, there is less danger of re-infection, and it is generally found to depress germination less; hence bluestone is especially useful for sowing smutty seed, or when sowing "dry," pickling early, or when sowing late.

MAKING UP THE PICKLE.

The making up of the pickling solution is very important, and no pains should be spared to accomplish it in a definite manner. The several brands of formalin now obtainable are of 37-38 per cent. strength, and can be used with confidence. The standard pickle strength required, viz.: 1 in 450, means 1 lb. of formalin added to 450 lbs. of water; the weight of formalin to be mixed must therefore be known, and the water can be conveniently measured with a kerosene tin, remembering that one gallon of water weighs 10 lbs. Formalin is often put up in bottles holding 1 lb. exactly, and to make 45 gallons of pickle one has then simply to pour the contents of the bottle into 45 gallons of water and stir the mixture with a stick.

To produce the bluestone pickle requires more time and labour, owing to the relative difficulty of dissolving bluestone. The 1½ per cent. standard solution means 1½ lbs. bluestone, by weight, dissolved in 10 gallons of water; and the quickest way to dissolve it is to suspend the weighed quantity in a piece of hessian *just under the surface of the water.* When using bluestone, the solution must be held in wooden or copper vessels; if kept for any length of time bluestone solution will concentrate, owing to evaporation, but formalin solution will gradually become weaker.

Pickling by Immersion.

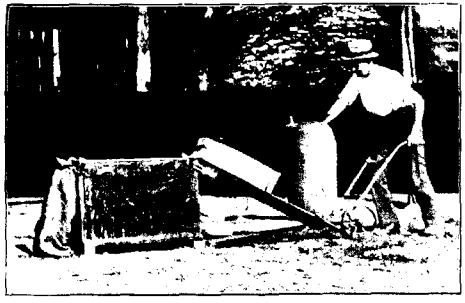


Fig. 1.—Wheeling untreated wheat on to the lifter.

Fig. 2.—Raising the wheat.

Fig. 3.—Wheat trickling into solution where it can be stirred and skimmed.

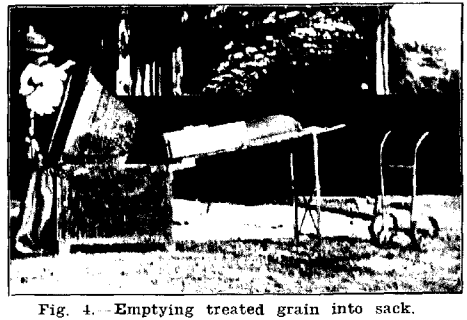


Fig. 4.—Emptying treated grain into sack.

PICKLING METHODS.

Any pickling method to be successful must fulfil three conditions:—

(1) Satisfy the principles enumerated above;

(2) Be not easily susceptible of abuse;

(3) It must be economical of time and labour.

There are three well known methods that more or less satisfy these conditions. They are:—

(1) *The barn-floor method.*—The grain from three or four bags is tipped on to a good floor, or into a large trough, and pickle made up as directed, is added to the grain from time to time as required, the grain being turned with a shovel until the mass is thoroughly and evenly moistened. In the hands of an expert, this is a very quick and satisfactory method, but for general use, since the end point depends on the energy and conception of the operator, it does not fulfil the second condition laid down, and for smutty seed it provides no method of getting rid of the smut-balls. Again, one may forget to dip the bag, and so possibly re-infect the seed.

(2) *The bag immersion method.*—Wheat is generally broken down into butts (afterwards convenient for use on the drill), and each of these is lowered into the standard pickle contained in a cask, and left there from four to five minutes. It is usual to vigorously lift the butt up and down in the pickle to cause even wetting of the grain, but the time of immersion will usually insure this. This way is undoubtedly slower than the barn-floor method, but it has the inestimable value of being independent of the skill of the operator, who, merely observing the rules, could pickle on a hundred occasions and still be sure that the treatment would be the same. That is to say, this *method is based on a time standard, and it will be noted* that the bag must necessarily also be disinfected.

(3) *Immersion in an open perforated vessel.*—Most farmers are satisfied with one or other of the above methods, or some modification of them, but all of which entail considerable labour without being ideal. Of late years, several good picklers embodying the above principle have been put on the market. They are of reasonable price, and are efficient in time, labour, and in operation. One style of machine consists of four essential parts as follows:—

(1) The bag-lifter;
(2) The perforated hopper;
(3) Watertight wooden vessel containing hopper and pickle;
(4) The bag holder.

The machine is so arranged that a bag of wheat may be wheeled to the bag lifter, the mouth opened, and lifter and all tilted until the grain begins to pour into the pickle held in the perforated copper

vessel, which in turn fits into the wooden hopper. By agitation any straw, cocky-chaff, backbones, or smut-balls rise to the surface and may be skimmed off. After four to five minutes' immersion the perforated hopper, which works on a swivel at one end, is pushed up clear of the pickle, drained rapidly, and the contents emptied into a bag attached to the bag holder. With this pickler seven to eight bags an hour can be pickled by one man. (*See* Figs 1, 2, 3, 4.)

There is another machine, in which the perforated vessel is attached by a pulley to a steel upright over the barrel. The perforated vessel can be raised or lowered, and it is on a swivel, so that it can be swung out from the barrel, filled, immersed, and swung out this time over a bag holder; the grain being restored to the bag after draining by releasing a false bottom in the perforated vessel.

To any farmer who is not satisfied with the results obtained with his present method, or who spends most of his evenings at seed time bending over a cask, or wielding a shovel, a modern pickling machine is worthy of his earnest consideration.

Machines of the perforated vessel type are in operation at the several seed stations of this Department, and have proved satisfactory in every respect.

POISONING CROWS.

By H. C. Churches, Dairy Supervisor.

Among the many pests that the man on the land has to contend with, the ubiquitous black crow may be placed well in the van for doing its share of destruction. Its cowardly attack on young lambs is well known to every sheep-owner. Small young pigs are also liable to attack, and as a cunning and daring egg thief the crow can take first place. That this pest, however, can be poisoned in fairly large numbers—especially during lambing season—has been proved by Mr. J. F. Jager, a local grazier at Swan Hill. The method adopted by him is to use, for preference, the freshly skinned carcass of sheep or lamb, flay it well, and smear evenly all over with S.A.P. rabbit poison, partly remove the entrails, smear them also, and replace. The fleshy side of the skin may be smeared in the same manner, and hung over a log or stump near at hand. If the carcass is treated while the animal heat is still in it, so much the better. This method of poisoning crows is superior to "baiting" with strychnine, or the practice of mixing strychnine and fat, the birds being generally able to disgorge the strychnine bait before it has time to have a fatal effect.

A tin or two of S.A.P. kept in secret places in the paddocks can be used on the carcass of any dead or dying sheep that may from time to time be found on the usual visit round the run.

GOVERNMENT CERTIFICATION OF STALLIONS.*

STALLION PARADES.

TIME TABLE, 1916.

(Subject to alteration on short notice.)

District and Date	Place.	Time.	Officer Arrives.	Officer Departs.
SPECIALS.				
Every Saturday:— June 24 to Dec. 23 ..	Agricultural Offices	10 a.m. to 12 noon		
July 17 to July 19 ..	City Horse Bazaar	10 a.m.		
July 24 to July 26 ..	Royal Show Grounds			
WIMMERA No. 1.				
Monday, July 3 ..	Ararat ..	2 p.m. ..	1.27 p.m. ..	7.50 p.m.
Tuesday, July 4 ..	Goroke ..	3.30 p.m. ..	3.15 p.m. ..	7 p.m.
Wednesday, July 5 } Thursday, July 6 }	Horsham ..	10 a.m. ..	10.20 p.m. (4th)	4.40 p.m. (6th)
Friday, July 7 ..	Stawell ..	12 noon ..	7.46 p.m. (6th)..	2.40 p.m.
MALLEE No. 1.				
Monday, July 10 ..				
Tuesday, July 11 ..	Mildura ..	2 p.m. ..	7 a.m. ..	6 p.m.
Wednesday, July 12..	Ouyen ..	2 p.m. ..	9.45 p.m. (11th)	9.45 p.m.
Thursday, July 13 ..	Sea Lake ..	3 p.m. ..	Driving ..	8.30 a.m. (14th)
Friday, July 14 ..	Wycheproof	11.50 a.m.	11.50 a.m. ..	12.40 p.m.
WESTERN No. 1.				
Tuesday, August 1 ..	Coleraine ..	11 a.m. ..	7.35 p.m. (July 31)	Driving
Tuesday, August 1 ..	Casterton ..	3 p.m. ..	Driving ..	8.30 a.m. (2nd)
Wednesday, August 2	Hamilton ..	3 p.m. ..	12 noon ..	6.10 a.m. (3rd)
Thursday, August 3 ..	Warrnambool	12 noon ..	9.52 a.m. ..	3.15 p.m.
Friday, August 4 ..	Camperdown	10 a.m. ..	5.10 p.m. (3rd)..	Driving
Friday, August 4 ..	Colac ..	2 p.m. ..	Driving ..	3.35 p.m.
WIMMERA No. 1.				
Monday, August 7 ..				
Tuesday, August 8 ..	Rainbow ..	2 p.m. ..	11.55 a.m. ..	8. 0 p.m.
Wednesday, August 9	Minyip ..	3 p.m. ..	Driving	6.22 p.m.
Thursday, August 10	Hopetoun ..	10 a.m. ..	10.40 p.m. (9th)	10.50 a.m.
Thursday, August 10	Warracknabeal	3 p.m. ..	1.35 p.m. ..	10.30 a.m. (11th)
Thursday, August 10	Geelong	3 p.m. ..	12.50 p.m. ..	6 p.m.
Friday, August 11 ..	Murtoa ..	2 p.m. ..	12.30 p.m. ..	5.50 p.m.

* Owing to pressure on space the Ninth Annual Report (Season 1915) by Mr. W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer, on the Veterinary Examination of Stallions, has been omitted and will appear in next issue.

STALLION PARADES, TIME TABLE—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
WIMMERA No. 2.				
Monday, August 14 ..				
Tuesday, August 15 ..	Kaniva ..	2 p.m. ..	2.28 a.m. ..	12.42 a.m. (16th)
Wednesday, August 16	Nhill ..	2 p.m. ..	1.24 a.m. ..	8.14 a.m. (17th)
Thursday, August 17	Dimboola ..	2 p.m. ..	10.19 a.m. ..	11 a.m. (18th)
Friday, August 18 ..	Jeparit ..	2 p.m. ..	12.23 p.m. ..	9.23 p.m.
MALLEE No. 2 AND CENTRAL No. 1.				
Tuesday, August 22 ..	Birchip ..	2 p.m. ..	8.20 p.m. (21st)	3.15 p.m
Tuesday, August 22 ..	Donald ..	5.15 p.m. ..	5.15 p.m. ..	5.50 a.m. (23rd)
Wednesday, August 23	St. Arnaud ..	10 a.m. ..	7.11 a.m. ..	2.10 p.m.
Wednesday, August 23	Maryborough	5 p.m. ..	5 p.m. ..	6.30 p.m.
Thursday, August 24	Smeaton ..	11 a.m. ..	Driving ..	Driving
Thursday, August 24	Daylesford ..	2 p.m. ..	Driving ..	3.25 p.m.
Friday, August 25 ..	Rochester ..	11 a.m. ..	9.49 p.m. (23rd)	1.36 p.m.
Friday, August 25 ..	Echuca ..	2.15 p.m.	2.15 p.m. ..	3.45 p.m.
Friday, August 25 ..	Elmore ..	5 p.m. ..	4.55 p.m. ..	9.25 a.m. (26th)
MALLEE No. 3.				
Monday, August 28 ..	Pyramid ..	3 p.m. ..	2.17 p.m. ..	9.4 p.m.
Tuesday, August 29 ..	Kerang ..	12 noon ..	10.16 p.m. (28th)	3.13 p.m
Wednesday, August 30	Swan Hill ..	9 a.m. ..	6.25 p.m. (29th)	10.50 p.m.
Wednesday, August 30	Quambatook	3 p.m. ..	Driving ..	Driving
Thursday, August 31	Bendigo ..	11 a.m. ..	10.45 a.m. ..	12.15 p.m.
Friday, Sept. 1 ..	Charlton ..	11 a.m. ..	4.7 p.m. (31st August)	1.45 p.m.
NORTH-EASTERN No. 1.				
Monday, Sept. 4 ..	Rutherglen	2 p.m. ..	1.48 p.m. ..	3.22 p.m.
Tuesday, Sept. 5 ..	Yarrawonga	10 a.m. ..	10.5 p.m. (4th)	Driving
Tuesday, Sept. 5 ..	Tungamah	3.30 p.m.	Driving ..	8.6 a.m.
Wednesday, Sept. 6 ..	Benalla ..	10 a.m. ..	10 a.m. ..	11.25 a.m.
Wednesday, Sept. 6 ..	Wangaratta	2 p.m. ..	12.7 p.m. ..	4.37 p.m.
Thursday, Sept. 7 ..	Euroa ..	10 a.m. ..	6.33 p.m. (6th)	11.11 a.m.
Thursday, Sept. 7 ..	Seymour ..	2 p.m. ..	12.5 p.m. ..	6.15 p.m.
Friday, Sept. 8 ..	Murchison ..	9.30 a.m.	7.30 p.m. (7th)	10.58 a.m.
Friday, Sept. 8 ..	Rushworth	2 p.m. ..	11.48 a.m. ..	4.56 p.m.

STALLION PARADES, TIME TABLE—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs
GOULBURN VALLEY No. 1.				
Monday, Sept. 11 ..	Numurkah ..	1 p.m. ..	12.18 p.m. ..	Driving
Monday, Sept. 11 ..	Cobram ..	2.30 p.m.	Driving ..	Driving
Monday, Sept. 11 ..	Nathalia ..	4.30 p.m.	Driving ..	Driving
Tuesday, Sept. 12 ..	Dookie ..	10 a.m. ..	Driving ..	Driving
Tuesday, Sept. 12 ..	Shepparton..	1 p.m. ..	Driving ..	Driving
Tuesday, Sept. 12 ..	Kyabram ..	3 p.m. ..	Driving ..	Driving
Tuesday, Sept. 12 ..	Tatura ..	4 p.m. ..	Driving ..	Driving
Wednesday, Sept. 13..	Mansfield ..	2 p.m. ..	1.50 p.m. ..	3.30 p.m.
Thursday, Sept. 14 ..	Alexandra ..	2 p.m. ..	12.25 p.m. ..	4.40 p.m.
Friday, Sept. 15 ..	Kilmore ..	9.30 a.m ..	9.50 p.m. (14th)	10.37 a.m.
Saturday, Sept. 16 ..	Werribee ..	12 noon ..	11.47 a.m. ..	1.36 p.m.
CENTRAL No. 2.				
Monday, Sept. 18 ..	Mernda ..	2 p.m. ..	12.50 p.m. ..	8 p.m.
Tuesday, Sept. 19 ..	Kyneton ..	3.30 p.m. ..	3.12 p.m. ..	5.5 p.m.
Wednesday, Sept. 20	Romsey ..	2 p.m. ..	10.21 a.m. ..	5.25 p.m.
Thursday, Sept. 21 ..	Bacchus Marsh	12 noon ..	9.11 a.m. ..	5.40 p.m.
Friday, Sept. 22 ..	Ballan ..	9 a.m. ..	6.33 p.m. (2 st)	10.5 a.m.
Friday, Sept. 22 ..	Ballarat ..	12 noon ..	11.8 a.m. ..	3.5 p.m.
SPECIAL.				
Monday, Sept. 25 ..	Royal Show	9 a.m. ..		
GIPPSLAND No. 1.				
Monday, October 2 ..	Warragul ..	2 p.m. ..	10.30 a.m. ..	7.36 p.m.
Tuesday, October 3 ..	Trafalgar ..	10 a.m. ..	8.8 p.m. (2nd) ..	11.16 a.m.
Tuesday, October 3 ..	Sale ..	2 p.m. ..	1.26 p.m. ..	4.33 p.m.
Wednesday, October 4	Traralgon ..	11 a.m. ..	5.42 p.m. (3rd)..	12.20 p.m.
Wednesday, October 4	Bairnsdale ..	3.30 p.m.	3.25 p.m. ..	5.40 a.m. (5th)
Thursday, October 5	Dandenong	3 p.m. ..	12.37 p.m. ..	6 p.m.
Friday, October 6 ..	Lang Lang..	9 a.m. ..	7.14 p.m. (5th)..	9.50 a.m.
Friday, October 6 ..	Korumburra	3 p.m. ..	10.32 a.m. ..	5 p.m.
GIPPSLAND No. 2.				
Monday, October 9 ..	Lilydale ..	3 p.m. ..	2.47 p.m. ..	5.35 p.m.
Tuesday, October 10	Dalyston ..	2 p.m. ..	10.34 a.m. ..	4.20 p.m.
Wednesday, Oct. 11 ..	Leongatha ..	10 a.m. ..	9.2 p.m. (10th)..	11.16 a.m.
Wednesday, Oct. 11 ..	Foster ..	2 p.m. ..	12.40 p.m. ..	8.11 p.m.
Thursday, October 12	Yarram ..	11 a.m. ..	10 p.m. (11th) ..	12.5 p.m.
Friday, October 13 ..				
NORTH-EASTERN No. 2.				
Tuesday, October 17..	Tallangatta	4.30 p.m.	4.30 p.m. ..	5 a.m. (18th)
Wednesday, Oct. 18..	Corryong ..	3.30 p.m.	3.30 p.m. ..	7 a.m. (19th)
Tuesday, October 17..	Orbost ..	3 p.m. ..	2.45 p.m. ..	8 a.m. (18th)
Wednesday, Oct. 25 ..	Omeo ..	3 p.m. ..	6.30 p.m. (24th)	6.30 a.m. (26th)

SUPPLEMENTARY LIST OF LIFE CERTIFICATED STALLIONS.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
			DRAUGHTS.			
2905	Abbey Dale ..	6 years	Mitchell and O'Brien	Agricultural Offices Special	18.3.16	W.M.L.
2805	Abbot's Pride ..	6 years	Hon. S. Winter-Cooke	Hamilton ..	14.7.15	R.G.
2813	Admiral Howard ..	6 years	R. N. Herkes ..	Newmarket ..	27.7.15	R.N.J.
2815	Aird Laddie ..	6 years	C. and E. C. Yeaman	Rochester ..	17.8.15	W.J.C.
2810	Albert Onward ..	5 years	T. Coldwell ..	Shepparton ..	12.8.15	R.N.J.
2819	Argyle	5 years	F. McRae ..	Warracknabeal ..	6.8.15	R.G.
2841	Barnay	5 years	G. and L. Smith ..	Shepparton ..	12.8.15	R.N.J.
2804	Baron	5 years	N. McDonald ..	Casterton ..	13.7.15	R.G.
2893	Baron's Heir ..	6 years	O. Maroske ..	New Zealand Exam.	6.9.15	..
2880	Baron's Heir ..	5 years	G. Fraser ..	Ballarat ..	10.9.15	R.G.
2856	Baron's Own ..	5 years	S. Nixon ..	Euroa	20.8.15	W.J.C.
2827	Blossom's Pride ..	5 years	T. McMillan ..	Mildura ..	4.8.15	W.M.L.
2896	Bonny Prince ..	5 years	D. Murphy ..	Echuca Special Exam.	6.10.15	W.M.L.
2829	Convincer ..	5 years	Dyke Bros. ..	St. Arnaud ..	6.8.15	W.M.L.
2820	Domination ..	5 years	A. Arnold ..	Warracknabeal ..	6.8.15	R.G.
2812	Drumelzier ..	5 years	J. R. McKenzie ..	Glenroy Special Exam.	16.7.15	E.A.K.
2851	Drum Style ..	5 years	R. Stewart ..	Kyabram ..	19.8.15	W.J.C.
2897	Fashion of the Day ..	5 years	D Murphy ..	Echuca Special Exam.	6.10.15	W.M.L.
2834	Fashion's Pride ..	5 years	A. D. McLarty ..	Swan Hill ..	11.8.15	W.M.L.
2878	Federal Chansman ..	5 years	McDonald and Draper	Yarra Glen Special Exam.	7.9.15	W.M.L.
2846	Federal Tax ..	5 years	C. N. Davies ..	Rochester ..	17.8.15	W.J.C.
2884	General Scott ..	5 years	A. Strawhorn ..	Kyneton ..	7.9.15	R.G.
2803	Glenbarr	5 years	McDougall Bros. ..	Ararat	5.7.15	R.G.
2895	Glenmarkie ..	6 years	J. McRae ..	Romsey	29.9.15	R.N.J.
2868	Grampian Star ..	5 years	D. McDonald ..	Camperdown ..	25.8.15	R.N.J.
2826	Hamilton's Pride ..	5 years	King Bros. ..	Birchip	3.8.15	W.M.L.
2857	Khartoum	5 years	T. Wignell ..	Euroa	20.8.15	W.J.C.
2847	Kilburnie	5 years	A. Yeaman ..	Rochester ..	17.8.15	W.J.C.
2800	King of the Kings ..	5 years	O. Maroske ..	Horsham ..	6.7.15	R.G.
2825	King of the Valley ..	5 years	C. B. Woodyard ..	Wangaratta ..	5.8.15	R.N.J.
2836	Laird of Selkirk ..	5 years	W. Troy ..	Kerang	12.8.15	W.M.L.
2818	Lanark Again ..	5 years	W. J. Moll ..	Dimboola ..	3.8.15	R.G.
2848	Lord Huntley ..	5 years	A. W. Butcher ..	Rochester ..	17.8.15	W.J.C.
2850	Major Lawrence ..	5 years	Berryman Bros. ..	Echuca	18.8.15	W.J.C.
2872	Mount Everest ..	6 years	J. A. McKenzie ..	Werribee	28.8.15	R.G.
2830	Newfield's Baron ..	5 years	J. Dawson ..	St. Arnaud ..	6.8.15	W.M.L.
..	Newton Stewart ..	5 years	W. Crozier ..	New South Wales Exam.	27.3.15	..
2853	Noble Knight ..	5 years	R. Barron ..	Tatura	19.8.15	W.J.C.
2863	Overton	5 years	A. McCallum ..	Jeparit	20.8.15	R.N.J.
2835	Premier Darnley ..	5 years	A. Lowrie ..	Swan Hill ..	11.8.15	W.M.L.
2808	Premier Glenorchy ..	5 years	Coonan and Caffrey	City Horse Bazaar	19.7.15	W.M.L.
2831	Premier Jack ..	5 years	G. Oxley, junr. ..	St. Arnaud ..	6.8.15	W.M.L.
2875	Prince Aldie ..	5 years	Brock Bros. ..	Trafalgar ..	3.9.15	R.G.
2817	Prince Edward ..	5 years	D. King and Sons	Rutherglen ..	2.8.15	R.N.J.
2854	Prince Imperial ..	5 years	A. Minchin ..	Tatura	19.8.15	W.J.C.
2821	Prince of Nullan ..	5 years	J. Annison ..	Warracknabeal ..	6.8.15	R.G.
2869	Referee	5 years	W. T. Manifold ..	Camperdown ..	25.8.15	R.N.J.
2887	Rob Roy	5 years	G. Butler ..	Maryborough ..	9.9.15	R.G.
2873	Royal Navy ..	5 years	J. McIlwain ..	Maffra	2.9.15	W.M.L.
2871	Scotland's Bloom ..	5 years	J. Wylie ..	Colac	27.8.15	R.N.J.
2838	Scottie	5 years	Hansen Bros. ..	Nhill	11.8.15	R.N.J.
2860	Scotty Chief ..	5 years	A. Rintoul ..	Nhill	18.8.15	R.N.J.
2882	Stanter	5 years	O. Syme ..	Gisborne Special Exam.	7.9.15	R.G.
2890	Sir Alick	5 years	Tippett Bros. ..	Ballarat ..	10.9.15	R.G.
2880	Sir Donald's Pride ..	5 years	J. Gregg ..	Korumburra ..	8.9.15	W.M.L.
2894	Sir Knight ..	5 years	Mitchell and O'Brien	New Zealand Exam.	6.9.15	..
2855	Sir Mac	5 years	A. J. Donaldson ..	Tatura	19.8.15	W.J.C.
2861	Stockman	5 years	C. H. Perkins ..	Rainbow ..	19.8.15	R.N.J.
2886	Territorial	6 years	F. D. McGauran ..	Yarram	9.9.15	W.M.L.
2862	The Crown	5 years	S. Atwell ..	Rainbow ..	19.8.15	R.N.J.
2807	The Leader ..	5 years	J. R. Jackson ..	Hamilton ..	14.7.15	R.G.

SUPPLEMENTARY LIST OF LIFE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
			DRAUGHTS—*continued.*			
2864	Topgallant ..	5 years	F. L. McIntosh ..	Juparit	20.8.15	R.N.J.
2801	Warkworth's Pride ..	6 years	G. Harris ..	Horsham ..	7.7.15	R.G.
2822	Wimmera Prince ..	5 years	C. Hewitt and Sons	Warracknabeal ..	6.8.15	R.G.
2837	Young Herod ..	5 years	A. R. Douglas ..	Kerang	12.8.15	W.M.L.
2883	Young Lord Lyon ..	6 years	W. and G. Main	Kyneton ..	7.9.15	R.G.
			THOROUGHBREDS.			
2904	Border King ..	6 years	P. Uren ..	Werribee ..	20.10.15	R.G.
2814	Doongara	5 years	J. R. Henry ..	Newmarket ..	26.7.15	R.N.J.
2816	Falmouth ..	7 years	A. F. Cullen ..	Rutherglen ..	2.8.15	R.N.J.
2876	Nadir	Aged	D. McIntosh ..	Melton	4.9.15	W.M.L.
2810	Problematic ..	5 years	H. T. Rust ..	City Horse Bazaar	19.7.15	R.G.
2811	The Vanquisher ..	Aged	Coonan and Caffrey	City Horse Bazaar	19.7.15	W.M.L.
			LIGHT HORSES.			
2806	Aristocrat ..	5 years	H. Jeitz ..	Hamilton ..	14.7.15	R.G.
2842	Billie Wilks ..	5 years	T. Moore ..	Shepparton ..	12.8.15	R.N.J.
2843	Cathedral Chimes ..	6 years	J. J. Mitchell ..	Northcote Special Exam.	13.8.15	R.G.
2823	Doctor Jack ..	6 years	J. H. Byron ..	Minyip	5.8.15	R.G.
2824	Don Alto	7 years	G. Maxwell ..	Wangaratta ..	5.8.15	R.N.J.
2866	Emulator's Pride ..	5 years	W. MacArthur ..	Camperdown ..	25.8.15	R.N.J.
2879	E.Y.O.	5 years	J. N. Bowman ..	Korumburra ..	8.9.15	W.M.L.
2865	Harry Alto ..	6 years	A. G. Hunter ..	Seymour ..	25.8.15	R.G.
2874	Honest Wilks ..	5 years	F. English ..	Trafalgar ..	3.9.15	R.G.
..	Len Rose II. ..	..	R. McNair ..	Tasmanian Exam.	8.8.14	..
2898	Lord Lindsy ..	7 years	R. London ..	Maldon Special Exam.	26.10.15	R.G.
2832	Match It	5 years	R. J. Wakeman and Sons	Pyramid ..	9.8.15	W.M.L.
2802	Obligation ..	5 years	J. McClounan ..	Horsham ..	7.7.15	W.M.L.
2809	Pride of Rothschild	7 years	Mitchell and O'Brien	City Horse Bazaar	19.7.15	R.G.
2844	Prince Harold Junior	5 years	H. A. Hussey ..	New South Wales Exam.	23.2.10	..
2849	Siam	5 years	R. Hunter ..	Rochester ..	17.8.15	W.J.C.
2877	Smuggler ..	Aged	R. F. England ..	Craigieburn Special Exam.	4.9.15	R.N.J.
2881	True Royal ..	5 years	F. Mackin ..	Korumburra ..	8.9.15	W.M.L.
2828	White Stockings ..	7 years	L. Brooks ..	Ouyen	5.8.15	W.M.L.
2839	Zolock O. ..	5 years	D. McLeod ..	Nhill	11.8.15	R.N.J.
			PONIES.			
2815	Assembler ..	5 years	F. Watson ..	Ararat	5.7.15	R.G.
2885	Brightlight ..	5 years	J. M. Brown ..	Yarram	9.9.15	W.M.L.
2858	Dandy Hero ..	5 years	E. Brock ..	Sea Lake ..	20.8.15	W.M.L.
2902	Dandy Nut ..	5 years	E. E. Small ..	French Is. Special Exam.	15.11.15	R.G.
2870	First Office ..	6 years	W. J. Trask ..	Colac	27.8.15	R.N.J.
2859	Gibbie	5 years	W. Sanders ..	Nhill	18.8.15	R.N.J.
2867	Gold Top ..	5 years	D. McDonald ..	Camperdown ..	25.8.15	R.N.J.
2900	Grainmyr	5 years	E. Whiting ..	Alexandra ..	11.11.15	R.G.
2892	Hauteur	6 years	R. V. Kelly ..	Melbourne ..	21.9.15	W.M.L.
2852	King Tony ..	5 years	J. H. Hunt ..	Kyabram ..	19.8.15	W.J.C.
2891	Leo	5 years	J. Brown ..	Agricultural Offices	11.9.15	W.M.L.
2833	Raouf	Aged	Dr. J. P. Ryan ..	Agricultural Offices	14.8.15	W.M.L.
2888	Sparrow	5 years	R. Jukes ..	Maryborough ..	9.9.15	R.G.
2899	The Joker	6 years	W. R. Williams ..	Maldon Special Exam.	26.10.15	R.G.
2901	Tim Brigham ..	Aged	G. Payne ..	Alexandra ..	11.11.15	R.G.

LIST OF TERMINABLE CERTIFICATED STALLIONS.

Four-year-old Certificates expiring 30th June, 1916.)

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
		DRAUGHTS.			
1061/4	Abbot's Pride	J. Grant	Melbourne	21.9.15	R.N.J.
1017/4	Arawa	J. R. McKenzie	Glenroy Special Exam.	16.7.15	E.A.K.
1023/4	Baron Abbot	McNamara and McDougall	Yarrawonga	3.8.15	R.N.J.
1025/4	Baron Milford	A. C. Petrass	Minyip	5.8.15	R.G.
1060/4	Baron Northcote	R. H. Grant	Ballarat	10.9.15	R.G.
1062/4	Baron Samson	J. Grant	Melbourne	21.9.15	W.M.L.
1041/4	Baron Twist	E. and C. Ham	Rochester	17.8.15	W.J.C.
1022/4	British Hope	J. R. Henry	New Zealand Exam.	1.7.15	
1034/4	Clan McGregor	Dookie Agricultural College	Dookie	9.8.15	R.N.J.
	Clermont	G. C. Duffy	Nhill	18.8.15	R.N.J.
1039/4	Colonel Young	H. W. Oberlin	Elmore	13.8.15	W.M.L.
1024/4	Duke of Dahlen	H. C. Jorgensen	Dimboola	3.8.15	R.G.
1019/4	Earl Dundonald	J. R. Henry	Newmarket	26.7.15	R.N.J.
1042/4	Federal Duke	E. Williamson	Charlton	18.8.15	W.M.L.
1015/4	Forward	E. M. Walter	City Horse Bazaar	19.7.15	W.M.L.
1035/4	Invermay	A. Colvin	Nathalia	11.8.15	R.N.J.
1020/4	Johnnie Walker	J. R. Stokes	Newmarket	26.7.15	R.N.J.
1056/4	King Albert	T. McKay	Kyneton	7.9.15	R.G.
1043/4	Lyndale	A. McKinnon	Charlton	18.8.15	W.M.L.
1016/4	Lord Everest	J. White	City Horse Bazaar	19.7.15	R.G.
1040/4	Model King	H. Boyd	Elmore	13.8.15	W.M.L.
1027/4	Newton Prince	H. C. Younger	Wangaratta	5.8.15	R.N.J.
1044/4	Orbost Again	P. A. Deckert	Nhill	18.8.15	R.N.J.
1063/4	Plunket's Pride	J. Hebbing	Melbourne	21.9.15	W.M.L.
1032/4	Premier Thomas	W. MacKnight	Swan Hill	11.8.15	W.M.L.
1011/4	Royal Salute	Fodey Bros.	Horsham	7.7.15	R.G.
1018/4	Royal Son	J. J. Gleeson	Warrnambool	26.8.15	R.N.J.
1036/4	Saxon Prince	T. Wearne	Numurkah	11.8.15	R.N.J.
1021/4	Scottie	G. W. Francis	Newmarket	29.7.15	R.N.J.
1059/4	Scottish Chief	J. Galloway	Maryborough	9.9.15	R.G.
1029/4	Shepherd King	J. Erwin, sen.	Pyramid	9.8.15	W.M.L.
1045/4	Starlight	G. J. Pickman	Nhill	18.8.15	R.N.J.
1038/4	Thorn Blend	J. Alexander	Shepparton	12.8.15	R.N.J.
1065/4	Young McClelland	H. McKinley	Romsey	20.9.15	R.N.J.
		THOROUGHBRED.			
1057/4	Bongore	J. Blair	Yarram	9.9.15	W.M.L.
		LIGHT HORSES.			
1054/4	Belmont Chimes	Belmont Stud Farm	Melbourne Special Exam.	2.9.15	R.N.J.
1031/4	Blue Wilks	J. W. McNeill	Colac	27.8.15	R.N.J.
1046/4	Connie Palm	W. H. Pollock	Dejarit	29.8.15	R.N.J.
1047/4	Corea	A. G. Hunter	Seymour	25.8.15	R.G.
1037/4	Fleet Wood	H. A. Fisher	Shepparton	12.8.15	R.N.J.
1050/4	Federal Chimes	D. Rowe	Camperdown	25.8.15	R.N.J.
1053/4	Marcus	N. Jones	Werribee	28.8.15	R.G.
1066/4	Nugong	T. N. Lade	Yea	19.10.15	R.N.J.
1058/4	Orient	D. Rodgers	Yarram	9.9.15	W.M.L.
1030/4	Straightway	L. Taylor	Pyramid	9.8.15	W.M.L.
1055/4	Sunny Voyage	J. M. Roche	Trafalgar	3.9.15	R.G.
1026/4	Wiltshire	A. A. Habel	Minyip	5.8.15	R.G.

LIST OF TERMINABLE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.

PONIES.

1028/4	Arabian	D. Fuller	Onyen	5.8.15	W.M.L.
1049/4	Commodore Nut	W. T. Manifold	Camperdown	25.8.15	R.N.J.
1012/4	Cymro	Dempster Bros.	Hamilton	14.7.15	R.G.
1031/4	Dandy Lion	Hon. J. Gibb	Geelong	12.8.15	R.G.
1018/4	Gay Gordon	J. R. McKenzie	Glenroy Special Exam.	16.7.15	E.A.K.
1052/4	Golden Locke	J. Jones	Colac	27.8.15	R.N.J.
1013/4	Harry Lauder	L. H. Fraser	Hamilton	14.7.15	R.G.
1014/4	Moonee Vale	J. McPhail	Agricultural Offices	17.7.15	W.M.L.
1064/4	Romance	Ingram Bros.	Melbourne	21.9.14	R.G.
1067/4	Stealaway	H. Sawers	Alexandra	11.11.15	R.G.

(Three-year-old Certificates expiring 30th June, 1916.)

DRAUGHTS.

1577/3	Abbot's Best	J. Egan	City Horse Bazaar	19.7.15	W.M.L.
1601/3	Abbotsford Champion	C. Elphick	New Zealand Exam.	14.6.15	..
1600/3	Abbotsford Signet	M. Hearne	New Zealand Exam.	14.6.15	..
1608/3	Aberdeen	Carnie Bros.	Numurkah	11.8.15	R.N.J.
1591/3	Albert McDonald	S. Spittle	Newmarket	28.7.15	R.N.J.
1578/3	Baron Abbott	P. McDonald	City Horse Bazaar	19.7.15	W.M.L.
1596/3	Baron Alexander	R. N. Scott	New Zealand Exam.	2.7.15	..
1579/3	Baron Black	Mitchell and O'Brien	City Horse Bazaar	19.7.15	W.M.L.
1612/3	Baron Carlyle	A. Gillies	Werribee Special Exam.	18.8.15	E.A.K.
1605/3	Baron Carrick	R. C. Hannah	Donald	2.8.15	W.M.L.
1592/3	Baron Cedric	J. R. Henry	Newmarket	26.7.15	R.N.J.
1574/3	Baron Cowden	Mitchell and O'Brien	New Zealand Exam.	17.5.15	..
1569/3	Baron Ramsay	J. Harry and Sons	Horsham	6.7.15	R.G.
1598/3	Baron William	N. Ramsay	New Zealand Exam.	2.7.15	..
1622/3	Belmont's Champion	Turner Bros.	Mernda	6.9.15	R.G.
1599/3	Bold Boy	C. Wragge	New Zealand Exam.	2.7.15	..
1588/3	Bonnie Baron	S. J. Berryman	City Horse Bazaar	20.7.15	W.M.L.
1609/3	Bonnie Belmont	W. Williams	Cobram	10.8.15	R.N.J.
1595/3	Criterion	H. Saunders	New Zealand Exam.	2.7.15	..
1580/3	Denmark	A. McWhinney	City Horse Bazaar	19.7.15	R.G.
1568/3	Dunkirk	P. Tonison	Melbourne Special Exam.	4.5.15	E.A.K.
1572/3	Dunsmore Memorial	R. Tucker	Horsham	7.7.15	R.G.
1593/3	Forrester	C. Hesfield	Newmarket	26.7.15	R.N.J.
1629/3	Gallipoli	W. Tallent	Ballarat	10.9.15	R.G.
1625/3	Gay Lad	J. Jamieson	Yarram	9.9.15	W.M.L.
1639/3	General Wolfe	A. W. Findley	Leongatha Special Exam.	25.2.16	R.G.
1611/3	Genevo	L. McLeod	Shepparton	12.8.15	R.N.J.
1635/3	Handsome Lad	A. M. Kerlin	Rochester Special Exam.	5.10.15	W.M.L.
1581/3	Harry Lauder	Mitchell and O'Brien	City Horse Bazaar	19.7.15	W.M.L.
1613/3	Ian King	Schubert Bros.	Sea Lake	20.8.15	W.M.L.
1597/3	Lee Creek Squire	W. Underwood	New Zealand Exam.	2.7.15	..
1624/3	Lucky Jim	R. J. Robertson	Kyneton	7.9.15	R.G.
1628/3	Lord Melbourne	J. Douglas	Maryborough	9.9.15	R.G.
1576/3	Lord Valecourt	J. H. Roulston	Coleraine	13.7.15	R.G.
1582/3	Lord Wigton	Mitchell and O'Brien	City Horse Bazaar	19.7.15	W.M.L.
1630/3	Marcilea	J. Smith and Son	Leongatha	10.9.15	W.M.L.
1618/3	Onward's Star	W. Powles	Corryong Special Exam.	26.8.15	R.G.
1583/3	Patriot	H. A. Armytage	City Horse Bazaar	19.7.15	R.G.
1621/3	Prince Alexander	J. B. Talbot	Maffra	2.9.15	W.M.L.
1602/3	Queen's First	P. Miller	Dimboola	3.8.15	R.G.
1584/3	Red Cross	Mitchell and O'Brien	City Horse Bazaar	19.7.15	W.M.L.
1638/3	Ripplevale	J. J. Downey and Sons	Ballarat Special Exam.	28.10.15	Appeal Board
1623/3	Royal Belmont	Turner Bros.	Mernda	6.9.15	R.G.
1610/3	Royal Colours	T. Thornton	Numurkah	11.8.15	R.N.J.

LIST OF TERMINABLE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
		DRAUGHTS—*continued.*			
1570/3	Shepherd Style	O. Muroske	Horsham	6.7.15	R.G.
1641/3	Squire Harold	Mitchell and O'Brien	New Zealand Exam.	7.3.16	..
1590/3	Squire William	Mitchell and O'Brien	New Zealand Exam.	15.6.15	..
1627/3	Tarra Noblesman	W. Cockbill	Yarram	9.9.15	W.M.L.
1585/3	The Bard	L. J. Weatherly	City Horse Bazaar	19.7.15	W.M.L.
1633/3	The Lion	G. Fairbairn	South Australian Exam.	11.7.15	..
1631/3	The Reformed Fashion	J. Burns	New Zealand Exam.	23.6.15	..
1586/3	The Saxon	Col. W. J. Clark	City Horse Bazaar	19.7.15	R.G.
1571/3	Victor Hugo	T. Maddern	Horsham	6.7.15	R.G.
1587/3	Willaston Glen	J. R. Stokes	City Horse Bazaar	19.7.15	R.G.
1594/3	Winter's Pride	Mitchell and O'Brien	Newmarket	28.7.15	R.G.
1615/3	Young Hero	J. Vennell	Nhill	18.8.15	R.N.J.
1614/3	Young Kelmscott	H. Thompson	Kaniva	17.8.15	R.N.J.
		LIGHT HORSES.			
1606/3	Al Borak	T. McCarthy	Mildura	1.8.15	W.M.L.
1619/3	Bald Rowan	McNeill Bros.	Cudac	27.8.15	R.N.J.
1620/3	Delicious	J. Eyeone	Werribee	28.8.15	R.G.
1637/3	Direct Lady	R. Linden	Mabloo	26.10.15	R.G.
1617/3	Fleetfoot	P. Fisher	Jeparit	20.8.15	R.N.J.
1636/3	Gospel Bells	G. H. Alford	Brighton Special Exam.	26.10.15	E.A.K.
1575/3	Grafton Again	W. J. Parish	Horsham	7.7.15	W.M.L.
1610/3	King Wilks	J. Bright	Leongatha Special Exam.	23.2.16	R.G.
1607/3	Merriton	G. M. Vallence	Kerang	12.8.15	W.M.L.
1626/3	Muskadoon	C. Barlow	Yarram	9.9.15	W.M.L.
1604/3	Sir Ivor	J. Bunge	Warracknabeal	6.8.15	R.G.
		PONIES.			
1632/3	Berkeley Swell	D. J. Reen	McPherson	21.9.15	W.M.L.
1602/3	Dandy Chief	E. W. Nock	Bendigo	23.7.15	R.G.
1634/3	Viscount	P. Quirk	Romsey	20.9.15	R.N.J.

(Two-year-old Certificates expiring 30th June, 1916.)

			DRAUGHTS.			
246/2	Lord Salisbury	R. McKenzie	Warracknabeal	6.8.15	R.G.
248/2	Royal Charm	F. N. Sallmann	Nhill	18.8.15	R.N.J.
245/2	The Standard	G. W. Plokford	Horsham	7.7.15	W.M.L.
			PONY.			
247/2	Crown Prince	J. A. Lane	Euroa	20.8.15	W.J.C.

RESULTS OF EXPERIMENTS, 1915.

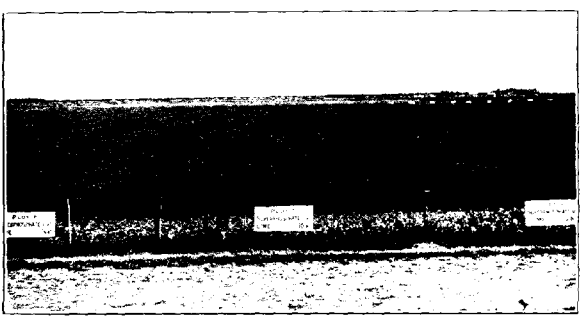
II. (*Continued from page* 152).

I.—LIGHT AND HEAVY DRESSINGS OF SUPERPHOSPHATE.

A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

The question of the quantity of manure to apply per acre to a wheat crop is of perennial interest to farmers. The seasonal conditions, quality of soil, amount and distribution of rainfall during the growing period and the methods of cultivation practised largely determine the actual amount.

The majority of our wheat soils are naturally deficient in soluble phosphates, and as the size of the crop is governed by the amount of the most deficient plant food present, it follows that from a nutritive point of view the amount of soluble phosphate in the soil is one of the limiting factors in crop production.



View of Permanent Fertilizer Plots, State Research Farm, Werribee.

Researches carried out in the chemical laboratory of this Department during the past year show that immediately superphosphate is applied to the soil it commences to revert into other forms. It changes more or less rapidly into citrate soluble phosphate, and a small portion becomes converted into insoluble phosphate. This process is called reversion, and the rate at which it proceeds depends on the type of soil.

Investigations have been conducted with typical wheat soils from various parts of the State to find out, (1) the rate at which reversion takes place with light and heavy dressings of super, and (2) the influence of the nature of the soil on the rate of change. The results of these investigations are approaching completion, and will be presented in due course. Suffice it to say for the present that the tests show that more than half of the water soluble phosphate in super. is reverted to citrate soluble phosphate within a week of its application, and that within a month practically the whole of the soluble phosphate is so converted.

Why, it may be asked, need we manufacture at considerable cost superphosphate from insoluble phosphates if this process of reversion takes place so quickly in our wheat lands. The explanation is probably as follows:—

Before the superphosphate reverts the soluble phosphate, which is its essential constituent, becomes dissolved in the soil water, and assumes a form infinitely more minute than can ever be attained by mechanical grinding. In this minute form it gets distributed evenly throughout the surface soil. Its superiority is due to its fineness of subdivision and its intimate diffusion through the soil.

Reversion of the water soluble phosphate takes place shortly after application of the super. to the soil; but wherever the root hairs of the plant may penetrate small quantities of citrate soluble phosphate in the most minutely subdivided form are everywhere awaiting absorption.

For the past three years tests have been conducted at the State Farms with the object of finding out the most profitable rate at which superphosphate could be applied per acre, and the results are summarized in the following tables.

The results are interesting inasmuch as they show the gross returns and net profits per acre (1) in wet seasons and (2) over an average of years.

The results in the case of Rutherglen are on an average of four years, and those of Werribee and Longerenong for three years.

I.

Returns from Plots treated with Light and Heavy Dressings of Superphosphate, Season 1915.

	Rutherglen.	Werribee.	Longerenong.	Average Returns from Three Centres.
No manure ..	6·0	20·0	37·5	21·0
½ cwt. Super. ..	10·8	27·5	49·4	29·2
1 cwt. Super. ..	15·6	28·75	51·3	31·9
2 cwt. Super. ..	12·0	28·0	54·7	31·6

II.

Average Yields for three seasons (1913-15) from Light and Heavy Dressings of Superphosphate.

	Longerenong.	Rutherglen.	Werribee.	Average of All Centres.
No manure ..	19·3	9·4	11·0	13·2
½ cwt. Super. ..	26·7	13·9	16·0	18·9
1 cwt. Super. ..	28·8	16·6	17·4	20·9
2 cwt. Super. ..	30·2	16·2	18·0	21·3

III.

Average net profits per acre from Light and Heavy Dressings of Superphosphate over unmanured plots for the Season 1915—Longerenong, Ruthergien, and Werribee combined.

Plot.	Average Yield for Three Centres.	Increase over no Manure Plot Bush.	Value of Increase, at 3s. 4d. Per Bush.	Cost of Manure.	Net Profit per acre over no Manure.
			£ s. d.	£ s. d.	£ s. d.
No manure	21·0	..	..	..	..
½ cwt. Super.	29·2	8·2	1 7 4	0 2 6	1 4 10
1 cwt. Super.	31·9	10·9	1 16 4	0 5 0	1 11 4
2 cwt. Super.	31·6	10·6	1 15 4	0 10 0	1 5 4

Average net profits per acre from Light and Heavy Dressings of Superphosphate over unmanured plots from all centres for Seasons 1913–14–15.

No manure	13·2	..	..	..	..
½ cwt. Super.	18·9	5·7	0 19 0	0 2 6	0 16 6
1 cwt. Super.	20·9	7·7	1 5 8	0 5 0	1 0 8
2 cwt. Super.	21·3	8·1	1 7 0	0 10 0	0 17 0

These four tables show conclusively that dressings of 1 cwt. of super. give a higher net return per acre after deducting the cost of manure than light dressings of ½cwt. per acre; and this is not only true in good seasons such as the one we have just experienced, but is also true of normal and droughty years.

Last year the half-hundredweight dressing gave an average net profit over the unmanured plot of £1 4s. 8d. per acre. In the case of the hundredweight dressing, however, the net profit per acre was £1 11s. 4d. per acre after deducting the cost of the manure.

For the past three years (which include the drought year) the average net profit per acre from all centres was 20s. 8d. per acre from the heavy dressing, as compared with 16s. 6d. per acre from the lighter application.

In these calculations the price of wheat was taken at 3s. 4d. per bushel. At present prices the net profits would be correspondingly greater. Moreover in addition to the direct returns as measured by grain yields, it must not be forgotten that the indirect returns from the grazing of sheep would be much greater with the heavy dressings than with the lighter dressings.

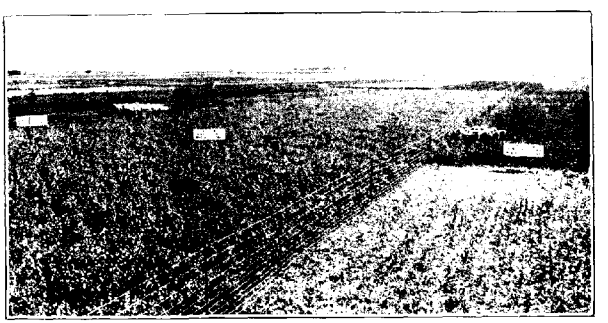
2.—GREEN MANURE TESTS.

One of the problems confronting every wheat-grower in the drier districts is to extract from the soil the highest possible wheat yield, and at the same time maintain unimpaired the productive power of the soil. In the oldest wheat districts there is evidence that some of the practices in vogue are slowly depleting the soil of its organic matter, which is the basis of soil fertility and productiveness.

Bare-fallowing is generally admitted to be the best preparation for a wheat crop in the drier districts, but it has two manifest objections. The land is lying idle for a whole year, bringing in no return; and, moreover, the practice of bare-fallowing in our dry climate undoubtedly leads to losses of organic matter.

Where land is cheap and has not long been cropped, these objections possibly do not carry weight. Where land values are high and wheat-growing has been practised for a generation, the matter is more serious. Instead of a year of idleness the land could be made in winter to produce some crop other than wheat, to be fed down by sheep, and subsequently worked through the summer as a partial fallow for a subsequent wheat crop. The practical question, however, is, would such procedure pay.

To answer this question was the objective of a set of experiments at the State Research Farm, Werribee, and while only two years' results are available, the figures obtained are certainly suggestive. Three years ago a set of twenty 1-acre plots were marked out at Werribee. Ten were sown with forage for feeding off and ploughing in, whilst ten were sown with wheat. By alternating the ten forage plots with the ten wheat plots each year, comparative results will be obtained of the value of wheat after each of the forages when fed off as compared with wheat following the same forages ploughed in.



General View of Green Manure Trials, State Research Farm, Werribee, showing method of feeding off Rye and Vetches and Cape Barley with Sheep.

The average results for the two seasons 1914-15 are as follow:—

TABLE I.—RETURNS FROM WHEAT PLOTS GROWN IN ROTATION WITH FORAGES FED OFF AND FORAGES PLOUGHED IN.

	1914.		1915.		Average Yields for Seasons 1914–1915.	
	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.
1. Wheat after Rape Fed Off	16	48	16	41	16	44½
2. Wheat after Barley „	16	43	19	21	18	2
3. Wheat after Pease „	18	39	21	35	20	7
4. Wheat after Vetches „	17	21	18	4	17	42½
5. Wheat after bare-fallow	20	12	21	44	20	58
6. Wheat after Rape, Ploughed in ..	18	9	21	23	19	46
7. Wheat after Barley „ ..	16	58	20	40	18	49
8. Wheat after Pease „ ..	16	27	23	17	19	52
9. Wheat after Vetches „ ..	15	26	20	12	17	49
10. Wheat after bare-fallow (manured) ..	21	22	23	29	22	25½

Note.—Plot 10 (Bare-fallow) received a double dose of manure, 1 cwt. being sown during fallowing operations, and 1 cwt. being sown with the wheat crop. Plot 5 received 1 cwt. when sown with wheat.

It will be noticed that the differences between the bare-fallow and the remaining plots were very marked in 1914 (the drought year), but that in 1915 two of the plots, viz., wheat after peas, both fed off and ploughed in, gave better returns than the corresponding plot of bare-fallow (Plot 5).

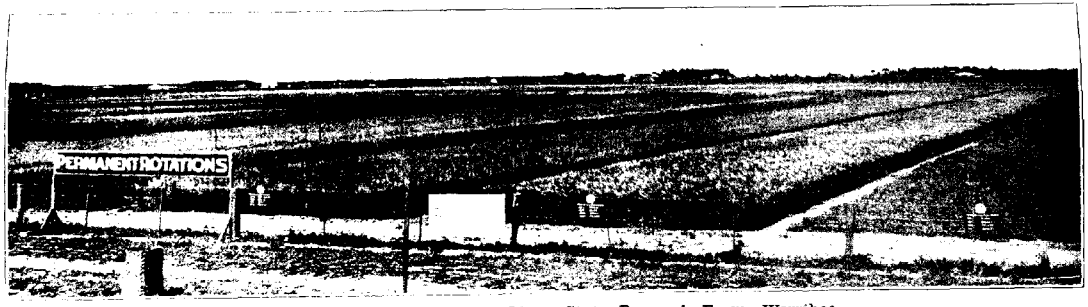
The results demonstrate that the yield of wheat grown after forages fed off with sheep are nearly as high as those in which the green crop was ploughed under. Neither systems, however, give as high a yield as bare-fallow, as might have been expected in a district where soil moisture is the limiting factor to crop production.

The net profit per acre obtained by growing wheat in rotation with forages fed off is, however, much higher than than after bare-fallow. In order to assess the cash value of the forages fed to the sheep, the increase of live weight in sheep during the depasturing of the crop was obtained by weighing a given number of sheep on and off the plots. The increase in live weight has been reckoned at 2d. per lb., and the increased value of the wool at 1½d. per head per week.

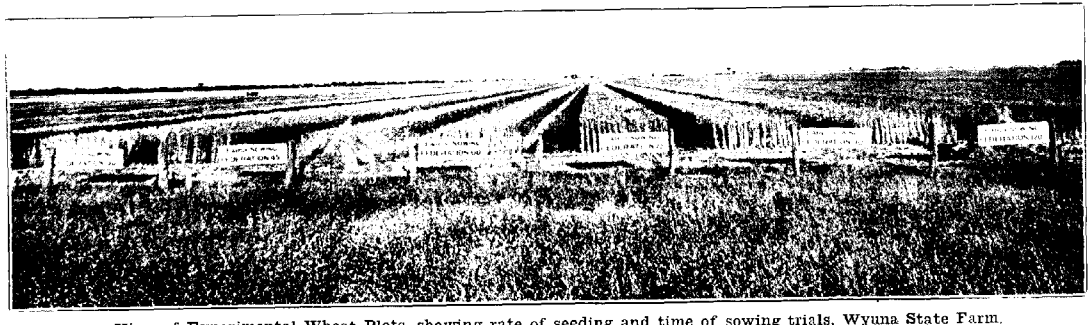
Green Manure Trials—Feeding off Cape Barley with Sheep.

This method of determining the value of the pasture has its limitations, but it gives a good idea of the relative stock-carrying capacity of each fodder. The results are summarized in the table.

—	Average Value of Fodder Crops in Seasons 1913–14.	Average Value of Wheat Crop at 4s. per bushel, 1914–15.	Average Gross Return for two years.
	£ s. d.	£ s. d.	£ s. d.
Plot 1. Rape	1 15 9	3 6 11	5 2 8
„ 2. Barley	2 13 1	3 12 2	6 5 3
„ 3. Pease	1 16 2	4 0 6	5 16 8
„ 4. Rye and Vetches	2 18 11	3 10 10	6 9 9
„ 5. Bare-fallow	..	4 3 11	4 3 11



View of Permanent Rotation Plots, State Research Farm, Werribee.



View of Experimental Wheat Plots, showing rate of seeding and time of sowing trials, Wyuna State Farm.

It will be seen that over a two years period a crop of wheat grown after bare-fallow gave a gross return of £4 3s. 11d. When grown in rotation with barley, rye and vetches fed off the gross returns range from £6 5s. 3d. to £6 9s. 9d. per acre—an increase over the bare-fallowed plot of £2 1s. 4d. and £2 5s. 10d. per acre.

The fodder crops were treated as catch crops, and the cost of cultivation, including seed and manure did not exceed 25s. per acre; consequently the net profit by growing wheat in rotation with forages fed off was, approximately, £1 per acre greater than growing wheat after bare-fallow.

The results are the more striking in that they include the drought year of 1914.

Precisely similar results were obtained at Rutherglen. In districts similarly situated to Werribee, enjoying a rainfall of 20 inches or over, the growing of wheat in rotation with forages fed off is likely to give bigger net returns than by growing wheat after bare-fallow. This applies particularly to the Western District wheat country and portions of the North-East and Gippsland.

3. RATE OF SOWING AND TIME OF SEEDING TRIALS.

During the past year a series of tests were carried out to determine the differences between early sowing and late sowing of early, midseason, and late varieties. Marshall's No. 3, Yandilla King, Federation, King's Early, and Gluyas wheats were sown in one batch on 16th April, 1915, and a second batch on 5th June at the State Research Farm, Werribee. The former date corresponds roughly to the beginning of the seeding in normal seasons, and the latter date agrees approximately with the completion of seeding. The plots were sown on worn-out clay land.

The results were as follows:—

EARLY SOWING (16th April).

	Bush.	lbs. per acre.
Marshall's No. 3	22	24
Yandilla King	24	32
Federation	21	20
King's Early	19	20
Gluyas	18	40

LATE SOWING (5th June).

Marshall's No. 3	21	4
Yandilla King	21	52
Federation	17	20
King's Early	26	24
Gluyas	24	48

Rainfall during the Growing Period.

Early sown plots, 10.8 inches.

Late sown plots, 8.65 inches.

It will be seen that the midseason and late maturing varieties, *e.g.*, Federation, Marshall's, and Yandilla King gave best results when sown early, the three early sown plots averaging 2 bushels 40 lbs. more per acre than the same varieties sown late. On the other hand, the early

maturing wheats, Gluyas and King's Early, with a short growing period, gave 6 bushels 36 lbs. more per acre when sown late in the season than when sown early. Similar results were obtained at other centres.

These results imply that the seeding season may be protracted if the farmer uses a judicious selection of early and late maturing wheat varieties. The seeding should be commenced with the late maturing types, such as Yandilla King, Marshall's No. 3, followed by midseason types as Federation, and the early maturing varieties such as Gluyas, Bunyip, and King's Early should be reserved until the completion of seeding.

The rate of seeding is closely connected with the time of sowing. Wheat sown early on well prepared land requires the minimum amount of seed.

The temperatures in April and early May favour speedy germination and vigorous healthy stooling. At the end of June the soil temperatures approach 41 deg. F., the temperature at which germination and plant growth are suspended.

Seed sown late needs thicker seeding to counteract the lessened germination and diminished stooling powers of the plant.

These points are well illustrated in the rate of sowing trials at Wyuna last season with Federation wheat.

EARLY SOWING (May).	Bushels.
30 lbs. per acre	31.4
45 ,, ,,	34.5
60 ,, ,,	36.6
75 ,, ,,	35.8
90 ,, ,,	34.7
120 ,, ,,	33.2

LATE SOWING (June).	
30 lbs. per acre	28.8
45 ,, ,,	27.3
60 ,, ,,	31.9
75 ,, ,,	34.0
90 ,, ,,	35.3
120 ,, ,,	32.1

The above table shows that the maximum yield per acre, 36.6 bushels, was obtained by sowing 60 lbs. of seed early in May. In spite of the mildness of the season and the late spring rains, none of the late sown plots quite equalled this yield. The maximum yield on the late sown plots was 35.3 bushels, but in order to secure this yield no less than 90 lbs. of seed per acre had to be used.

The rainfall during the growing period was 12.85 inches.

COST OF PRODUCTION OF FIELD CROPS.

I.—WHEAT.

By H. C. Wilson, Manager, Central Research Farm; and A. J. Whelan, Field Officer, Werribee.

(Continued from page 413, July *Journal*, 1915.)

In the July number of this *Journal* last year, the costs of preparation, including seeding of a wheat crop at the Central Research Farm, Werribee, was discussed. The present article deals with harvesting expenses of this crop, and presents a balance-sheet.

The results should correspond with costs under similar conditions of soil and climate in other localities.

The July article gave full detailed costs of the operations leading up to and including seeding. (See Table 1.) The field of wheat, which was approximately 345 acres, was looking well and stooling freely when the former article was written.

Harvesting has now been completed, and the detailed costs can be seen in Table No. 2.

In harvesting this field, three separate series of operations were conducted. This was found necessary, because nothing but pure seed wheat was sown, and the crop, comprising some thirteen varieties, was gathered for seed. The three operations consisted of:—

(1) Harvesting 12 acres of headland for hay.
(2) Harvesting with binder 309 acres for threshing.
(3) Stripping and winnowing 24 acres, comprising three varieties, the areas of which were not large enough to be harvested by the threshing method.

HARVESTING HEADLANDS FOR HAY.

A headland of ½ chain of King's Early wheat was sown around this field, and the total, 12 acres, was cut for hay on 20th to 22nd October, 1915. This headland acted as a break for wind and ravages of pests, as well as a protection from the possibility of mixing grain at the ends of the several plots of different varieties sown.

Hay was harvested very early in the season, and valued in the stack, on 10th November, 1915, at £5 per ton.

The total hay harvested from the 12 acres, and weighed over the farm weighbridge before stacking, was 26 tons. Therefore, the gross value amounted to £130.

The cost of all operations connected with the production of this hay, including rent of the land, and a share in the whole of the incidental expenses incurred, was £35 7s. 5d.; which means £2 18s. 11½d. per acre, or £1 7s. 2½d. per ton. It seems, in the face of these figures, that, unless the farmer can realize approximately 30s. per ton for his hay in the stack, even though he has a normal season and a fair crop, the occupation would be unprofitable.

CUTTING CROP FOR GRAIN, AND THRESHING.

Harvesting by means of the threshing machine seems the most popular method of handling a wheat crop for grain in this locality.

Firstly, because it has the advantage of a market near at hand for baled straw; and secondly, the damp coastal conditions do not permit of efficient harvesting of large quantities of grain by means of the stripper and winnower, or combined harvester.

Ploughing with Disc Plough, State Research Farm, Werribee.

Ploughing with Mould-board Plough, State Research Farm, Werribee.

Of the 345 acres harvested, 309 acres were cut with the binder for threshing. The work was started on 2nd December, and the separate operations of cutting, stooking, carting, and stacking of wheat in the sheaf, were carried out in December, 1915.

Table No. 1.

Actual cost of Wheat Seeding, Season 1915.

Tillage Operation.	Date of Operation.	Value per Ton of Oaten Chaff. s. d.	Value per Ton of Oaten and Lucerne Chaff Mixed. s. d.	Value per Bushel Crushed Oat Seconds. s. d.	Value per Ton Beet Sugar Molasses. s. d.	Ration Feed to each Horse per Day Average for Team.	No. of Horses Fed.	Cost of Ration per Horse per Day. s. d.	Total Cost of Ration per Day per Team. s. d.	No. of Days Fed for Operation.	Total Cost of Horse Feed for Operation. £ s. d.	No. of Days of Labour Paid.	Rate per Day of Labour Paid. s. d.	Total Cost of Labour for Operation. £ s. d.	Cost of Oil and Repairs. s. d.	10% Depreciation on Value of Implements. s. d.	10% Depreciation on Value of Horses. s. d.	5% Interest on Value of Implements. s. d.	5% Interest on Value of Horses. s. d.	Total No. of Acres Cultivated.	No. of Acres per Day per Implement Cultivated.	Cost per Acre of each Operation. s. d.	Total Cost of each Operation. £ s. d.
Ploughing ..	1914. June 26th 18th Aug.	50 0	..	2 0	..	Oaten Chaff 38 lbs. Oats, seconds, 7 lbs.	12	1 2¾	14 10	54	40 1 0	92	8 0	36 16 0	70 0	13 9	138 0	6 10½	69 0	345	3¾	5 3½	91 14 7½
Double Harrowing	19th Aug. 3rd Sept.	50 0	..	2 0	..	Oaten chaff, 28 lbs. Oats, seconds, 7 lbs.	12	1 2¾	14 10	16	11 17 4	26	8 0	10 8 0	12 6	2 6	35 0	1 0	17 6	345	26½	0 8 7/10	25 13 4
Harrowing	24th Sept. 11th Oct.	..	70 0	2 3	30 0	Oaten and Lucerne chaff mixed, 31 lbs. Oats, seconds, 2½ lbs. Beet Molasses, 2 lbs.	6	1 1¾	6 10½	18	5 17 0½	10	8 0	5 8 0	6 6	1 2	19 8	0 7	9 10	345	24½	0 9 1/10	13 9 6
Harrowing	28th Nov. 12th Dec.	..	90 0	2 6	30 0	,, ,,	6	1 5¼	8 7½	15	6 9 4	4 / 13	7 0 / 7 0	4 11 0	6 2	1 0	16 5	0 6	8 2½	345	20½	0 8¾	12 12 7½
Spike rolling and Harrowing	29th Dec. 1915. 26th Jan.	..	110 0	3 6	30 0	,, ,,	6	1 9	10 6	30	15 15 0	26	7 0	9 2 0	15 0	4 11	32 10	2 5½	16 5	345	13¼	1 7¾	28 8 7½
Cultivation, 3½" deep	26th Jan. 27th Feb.	..	140 0	4 0	30 0	,, ,,	5	2 2½	10 11¾	49	26 15 11	44	7 0	15 8 0	22 0	10 9	45 8	5 4½	22 10	345	7¼	2 9	47 10 6½
Harrowing before drilling	17th April 3rd May	..	180 0	5 0	30 0	,, ,,	6	2 10	17 0	18	15 6 0	15	7 0	5 5 0	6 6	1 2	19 8	0 7	9 10	345	23	1 3⅗	22 8 9
Drilling ..	17th April 3rd May	..	180 0	5 0	30 0	,, ,,	8	2 10	22 8	13½	15 6 0	23	7 0	8 1 0	9 0	6 1	20 8	3 0½	10 4	345	15	1 5⅗	25 16 1½
Harrowing after drilling	17th April 3rd May	..	180 0	5 0	30 0	,, ,,	6	2 10	17 0	18	15 6 0	15	7 0	5 5 0	6 6	1 2	19 8	0 7	9 10	345	23	1 3⅗	22 8 9
Seeding ..	17th April 3rd May	Total graded seed wheat sown, 356¼ bushels, at 9s. per bushel = 62 lbs. sown per acre. Cost per acre and total cost of seed wheat ..																			..	9 3⅞	160 8 6
Manuring ..	17th April 3rd May	Total superphosphate, 36/38% Sol., 16¼ tons, at £4 5s. per ton = 107 lbs. sown per acre. Cost per acre and total cost of manure																			..	4 0¾	70 2 6
		Rent of land, 12s. per acre, for eighteen months. Total cost per acre, £1 10s. 2¼d. Total cost, 345 acres, to date																			..	..	520 13 10½

To be added after harvest = £207 ; £4 11s. 6d., temporary improvements.

Table No. 2.

Actual cost of Harvesting, Season 1915–16.

Harvesting Operations.	Date of Operation.	No. of Horses Worked.	No. of Days Worked.	Cost of Horses for each Operation. *2s. 6d. per day. £ s. d.	No. of Men.	No. of days of Labour.	Rate of Pay Per Day. s. d.	Cost of Labour for Operation. £ s. d.	Cost of Binder Twine. £ s. d.	Cost of Oil and Repairs. £ s. d.	Depreciation and Interest on Implements. £ s. d.	No. of Acres of each Operation.	Cost Per Acre of each Operation. s. d.	Total Cost of each Operation. £ s. d.	Total Cost of Harvesting and Produce. £ s. d.
Headlands cut for hay ..	20th to 22nd Oct.	3	2	0 15 0	1	2	9 0	0 18 0	1 5 0 (12 balls)	0 5 0	0 10 0	12	6 1	3 13 0	
Stooking, carting, and stacking hay	25th Oct. to 10th Nov.	4	3	1 10 0	2	10	9 0	4 10 0	..	..	0 5 0	12	10 5	6 5 0	9 18 0
Cutting crop for threshing ..	2nd to 18th Dec.	12	15	22 10 0	2	30	10 0	15 0 0	20 8 6 (16 bales)	3 15 0	7 10 0	309	4 5¾	69 3 6	
Stooking, Carting, and stacking	10th to 31st Dec.	12	12½	18 15 0	20	250	9 0 (16 men) 10 0 (4 men)	115 0 0	..	..	6 5 0	309	9 1	140 0 0	
Threshing and stacking straw	14th to 31st Jan.	Contract work.			..	..	..	..	..	..	Total cost		..	124 6 11	
Carting wheat to store ..	14th to 31st Jan.	15	9	16 7 6	4	36	7 6	13 10 0	..	..	3 7 6	300	2 2¼	33 15 0	
Pressing straw	27th Jan. to 14th Feb.	Contract work.			..	..	..	..	..	..	Total cost		..	200 17 1	
Carting straw to station ..	27th Jan. to 16th Feb.	10	16	20 0 0	2	32	7 6	12 0 0	..	..	4 0 0	309	2 4	36 0 0	
Loading straw on trucks ..	27th Jan. to 16th Feb.	Contract work.			..	..	..	..	..	..	Total cost		..	5 7 6	
Cost of sacks and twine ..		Sacks, £88 3s. 9d.; twine, 30s.						..	..	..	Total		..	89 13 9	699 3 9
Stripping	17th to 23rd Dec.	3	4	1 10 0	1	4	10 0	2 0 0	..	0 6 0	0 12 0	24	3 8	4 8 0	
Winnowing	27th to 31st Dec.	..	..	..	2	4	9 0	3 12 0	..	0 2 0	0 8 0	24	3 5	4 2 0	
Carting wheat to store ..	1st Jan. ..	15	2½	1 8 1½	1	3	7 6	1 2 6	..	..	0 3 9	24	2 3	2 14 4½	
Cost of sacks and twine ..		Sacks, £7 4s. 6d.; twine, 2s. 6d.						..	..	..	Total		..	7 7 0	18 11 4½
		Temporary improvements, £4 11s. 6d.; rent of land, £207											..	211 11 6	211 11 6
		Grand total cost of harvesting, &c.												..	939 4 7½

*2s. 6d. per day per horse has been allowed in reckoning the cost of the harvesting operations, and was based on the cost of feeding with interest and sinking fund added.

Threshing, stacking straw, and carting wheat to the barn was undertaken from the 14th to the 31st of January last. The straw was baled, carted to the Werribee railway station, and loaded on trucks for sale, from 27th January to 16th February, 1916.

Cutting Wheat for Threshing.

Threshing the Grain.

The weather was very favorable throughout the harvesting operations, and little delay was caused in the work by wet conditions.

Harvesting work was done by the permanent farm hands and temporary harvest workers at the ruling district rates of pay. The cost per acre can be seen in Table No. 2.

Threshing, baling straw, and loading pressed straw on trucks at Werribee railway station, was let to contractors; and this season, because of the high rates of labour, and increased prices of material through the war, the cost for this contract work has advanced 20 per cent.

However, the total cost of the whole of the harvesting operations of the 309 acres, from the time the crop was cut until the wheat was delivered into the barn, and the baled straw loaded on the trucks, inclusive of sacks and twine, was £699 3s. 9d., or £2 5s. 3d. per acre. Add to this the cost last season of all operations up to and including seeding, £1 10s. 2¼d. per acre; rent of land, 12s. per acre; and temporary improvements, which worked out at, approximately, 3d. per acre (see Table No. 1), it will be found that the total cost of production was £4 7s. 8¼d. per acre. The profit on the venture will be seen in the balance-sheet below.

STRIPPING AND WINNOWING.

Harvesting wheat by this means is not favoured locally, as previously mentioned; but it was found necessary to strip 24 acres, because the three varieties of grain grown, viz., Dart's Imperial, Commonwealth, and Warden, were in plots which were considered too small to be efficiently handled without loss or chance of mixing the grain by means of the thresher.

On 17th to 23rd December, 1915, stripping of this area was undertaken, and winnowing completed on the 31st. Fortunately, good weather conditions were experienced, and the cost of this method of harvesting will be seen in Table No. 2.

The total, including the cost of sacks, twine, cartage of wheat to the barn of the 24 acres, amount to £18 11s. 4½d., or 15s. 5½d. per acre. Add to this the cost of all operations up to and including seeding, £1 10s. 2¼d., per acre; 12s. per acre, rent of land; 3d. per acre, temporary improvements; and the total is £2 17s. 10¾d. per acre. The profit on this method of producing and harvesting wheat will be noticed in the balance-sheet.

COST OF PRODUCTION.

The total cost of harvesting the hay, grain, and straw from this 345-acre field was £727 13s. 1½d., or £2 2s. 2¼d. per acre. Add to this the expense incurred in all operations up to and including seeding, together with cost of seed wheat and manure, as detailed in Table No. 1, amounting to £520 13s. 10½d.; also rent of the land, £207; temporary improvements, £4 11s. 6d.; and the grand total amounts to £1,459 18s. 6d., or £4 4s. 7½d. per acre. The balance-sheet below will show the gross returns, and the profit realized from this field.

ITEMS OF INTEREST IN THE BALANCE-SHEET.

The balance sheet has been prepared with a view of showing:—

(1) The net profit which has been made this year from a field of 345 acres of wheat.

(2) The individual profits which have been realized from the three series of operations necessary in the practical harvesting of the field.

The net profit from the 345 acres was £1,222 4s. 7d., or £3 10s. 10¼d. per acre.

COST OF PRODUCTION OF WHEAT.

BALANCE-SHEET. SEASON 1915–16.

Date.	Dr.	Cost.	Profit.	Date.	Cr.	Value of Produce.	Totals.
	Hay from Headlands.	£ s. d.	£ s. d.			£ s. d.	£ s. d.
22nd June, 1914, to 16th Feb., 1916	Cost of production of 12 acres of hay in stack. (For details see Tables No. 1 and 2	35 7 5		10th Nov., 1915	Valuation of hay in stack—26 tons, at £5 per ton ..	130 0 0	130 0 0
	By credit balance net profit	..	94 12 7	1st Feb., 1916	7,171 bushels of wheat, firsts, at 4s. 9d. per bushel in barn	1,703 2 3	
	Wheat and Straw from Threshing.				683 bushels of wheat, seconds, at 4s. per bushel in barn	136 12 0	
,,	Cost of production of 309 acres of wheat and straw. For details see Tables Nos. 1 and 2	1,355 0 10¾			287 tons of baled straw, net realised	569 1 8	2,408 15 11
	By credit balance net profit	..	1,053 15 0¼				
	Wheat Harvested by Stripper and Winnowed.			1st Feb., 1916	558⅔ bushels of wheat, firsts, at 4s. 9d. per bushel in barn	132 13 8	
,,	Cost of production of 24 acres of wheat. For details see Tables No. 1 and 2 ..	69 10 2¼			53⅓ bushels of wheat, seconds, at 4s. per bushel in barn	10 13 6	143 7 2
	By credit balance net profit	..	73 16 11¾				
	Total cost of production from 345 acres	1,459 18 6					
	Net profit from the total 345 acres	..	1,222 4 7				
	Total	£2,682 3 1			Total value of produce ..	..	2,682 3 1

This profit was made on the following prices of produce:—
Hay sold for £5 per ton in the stack on 10th November, 1915.
Straw sold for £1 19s. 7¾d. per ton in January, 1916.
Wheat—Firsts, 4s. 9d. per bushel in barn.
Seconds, 4s. per bushel in barn.

The hay and straw both realized prices above the average because of the early market secured, while the wheat was valued at 4s. 9d., and not sold. As it is stud seed, sown and harvested as such, a somewhat increased cost of production was incurred. But, for a purpose of valuation, 4s. 9d. per bushel was taken as the marketable value of this grain as a f.a.q. sample only. If, however, the actual value of the wheat after grading had been reckoned in the balance-sheet, the net profit would have been much greater; but this would be hardly fair from a practical, wheat-growing stand-point.

The individual profits from the three series of harvesting operations actually carried out were:—

1.—*Harvesting the Headlands for Hay.*

		£	s.	d.
12 acres.	Value of hay	130	0	0
	Cost of production ...	35	7	5
	Net profit	94	12	7

A profit of £7 17s. 8½d. per acre was made, which is unusually large, because of the very high price of £5 per ton realized by securing the November market in a year of great scarcity. If, however, the present value be taken, quite a lean margin of profit would be shown.

2.—*Harvesting with the Binder, Threshing, and Straw Pressing.*

		£	s.	d.
309 acres.	Value of wheat and straw ...	2,408	15	11
	Cost of production ...	1,355	0	10¾
	Net profit	1,053	15	0¼

A profit of £3 8s. 2½d. per acre was made, based on f.a.q. wheat, at 4s. 9d., seconds at 4s., and straw at £1 19s. 7¾d. per ton.

3.—*Harvesting by means of the Stripper and Winnower.*

		£	s.	d.
24 acres.	Value of wheat	143	7	2
	Cost of production ...	69	10	2¼
	Net profit	73	16	11¾

A profit of £3 1s. 6½d. per acre was made; with the wheat at f.a.q. value, 4s. 9d.; and seconds at 4s.

A comparison of the above two methods of harvesting a crop of wheat for grain will show that the profit per acre came out in favour of the threshing and pressing by 6s. 8d. per acre. This is, no doubt, due to the ready market obtainable for the pressed straw, and the good price obtained this season at Werribee.

TABLE No. 3.

COST OF SEEDING, WITH AVERAGE MARKET VALUES FOR FEED ON FARM.

Tillage Operation.	Date of Operation.	Value per Ton of Oaten Chaff.	Value per Ton of Oaten and Lucerne Chaff Mixed.	Value per Bushel Crushed Oat Seconds.	Value per Ton Beet Sugar Molasses.	Ration Fed to each Horse per Day Average for Team.	No. of Horses Fed.	Cost of Ration per Horse per Day.	Total Cost of Ration per Day per Team.	No. of Days Fed for Operation.	Total Cost of Horse Feed for Operation.	No. of Days of Labour Paid.	Rate per Day of Labour Paid.	Total Cost of Labour for Operation.	Cost of Oil and Repairs.	10% Depreciation on Value of Implements.	10% Depreciation on Value of Horses.	5% Interest on Value of Horses.	5% Interest on Value of Implements.	Total No. of Acres Cultivated.	No. of Acres per Day per Implement Cultivated.	Cost per Acre of each Operation.	Total Cost of each Operation.
	1914.	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*			*s.* *d.*	*s.* *d.*		£ *s.* *d.*		*s.* *d.*	£ *s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*			*s.* *d.*	£ *s.* *d.*
Ploughing..	26th June 18th Aug.	55 0	.. ..	1 9 ..		Oaten chaff, 38 lbs. Oats, seconds, 7 lb.	12 1	3 15 0	54	40 10 0	92	8 0	36 16 0	70 0	13 9	138 0	69 0	6 10½	345	33½	5 4	92 3 7½
Double harrowing	19th Aug. 3rd Sept.	55 0	.. 1	0 ..		,, ,,	12 1	3 15 0	16	12 0 0	26	8 0	10 8 0	12 6	2 0	35 0	17 6	1 0	345	26½	0 9	25 16 0
Harrowing..	24th Sept. 11th Oct.	.. 60	0 1	9 30	0	Oaten and lucerne chaff mixed, 31 lbs. Oats, seconds, 2½ lbs. Beet molasses, 2 lbs.	6 0	11½ 5 9	18	5 3 6	10 4 7	8 0	5 8 0	6 6 1	2	19 8	9 10	0 7	345	24½	0 8½	12 9 3
Harrowing..	28th Nov. 12th Dec.	.. 60	0 1	9 30	0	,, ,,	6 0	11½ 5 9	15	4 6 3	13 7	6 0	4 11 0	6 2	5 0	16 5	8 2½	0 6	345	26½	7½	10 9 0½
Spike rolling and harrowing	20th Dec. 1915. 26th Jan.	.. 60	0 1	9 30	0	,, ,,	6 0	11½ 5 9	30	8 12 6	26 7	0	9 2 0	15 0	4 11	32 10	16 5	2 5½	345	133½	2½	21 6 1½
Cultivation, 3½" deep	26th Jan. 27th Feb.	.. 60	0 1	9 30	0	,, ,,	5 0	11½ 4 9½	49	11 14 9½	44 7	0	15 8 0	22 0	10 9	45 8	22 10	5 4½	345	7½	1 10½	32 9 5
Harrowing before drilling	17th April 3rd May	.. 60	0 1	9 30	0	,, ,,	6 0	11½ 5 9	18	5 3 6	15 7	0	5 5 0	6 6	1 2	19 8	9 10	0 7	345	23	8½	12 6 3
Drilling ..	20th April 3rd May	.. 60	0 1	9 30	0	,, ,,	8 0	11½ 7 8	133½	5 3 6	23 7	0	8 1 0	9 0	6 1	20 8	10 4	3 0½	345	15	11	15 13 7½
Harrowing after drilling	17th April 3rd May	.. 60	0 1	9 30	0	,, ,,	6 0	11½ 5 9	18	5 3 6	15 7	0	5 5 0	6 6	1 2	19 8	9 10	0 7	345	23	8½	12 6 3
Seeding ..	17th April 3rd May	Total graded seed wheat sown, 356½ bushels, at 5s. 6d. = 62 lbs. per acre. Cost per acre and total cost of seed wheat																			5 8½	98 0 9
Manuring ..	17th April 3rd May	Total superphos-phate, 36/38 % sol. sown, 1½ tons, at £45 per ton = 107 lbs. per acre. Cost per acre and total cost of manure																			4 0½	70 2 6
		Rent on land, 12s. per acre, for eighteen months. Total cost per acre, £1 8s. 4½d. Total cost, 345 acres to date																				403 3 4

To be added after harvest = £207 + £4 11s. 6d., temporary improvements.

TABLE NO. 4.

COST OF HARVESTING UNDER NORMAL CONDITIONS.

Harvesting Operations.	No. of Horses Worked.	No. of Days Worked.	Cost of Horses for each Operation.	No. of Men.	No. of Days of Labor Paid.	Rate of Pay per Day.	Cost of Labor for Operation.	Cost of Binder Twine.	Cost of Oil and Repairs.	Depreciation and Interest on Implements.	No. of Acres of each Operation.	Cost per Acre of each Operation.	Total Cash of each Operation.	Total Cash of Harvesting Produce.
			2s. per day. £ s. d.			s. d.	£ s. d.	12 balls. £ s. d.	£ s. d.	£ s. d.		s. d.	£ s. d.	£ s. d.
Headlands, cut for Hay	3	2	0 12 0	1	2	3 0	0 18 0	1 5 0	0 5 0	0 10 0	12	5 10	3 10 0	..
Stooking, carting, and stacking hay	4	3	1 4 0	2	10	9 0	4 10 0	..	..	0 5 0	12	9 11	5 19 0	9 9 0
								116 balls.						
Cutting crop for threshing	12	15	13 0 0	2	30	10 0	15 0 0	20 8 6	3 15 0	7 10 0	309	4 2¼	64 13 6	..
Stooking, carting, and stacking	12	12½	15 0 0	20	250	16 9s./18 1 at 10s.	115 0 0	..	..	6 5 0	309	8 9	136 5 0	..
Threshing and stacking straw	..	Contract work, 2,330 bags of firsts, at 3s. 5s. per 100 bags.						Total cost	..	..	..	..	77 13 6	..
Carting wheat to store	15	9	13 10 0	1	36	7 6	13 10 0	..	..	3 7 6	309	2 0	30 17 6	..
Pressing straw		Contract work, 287 tons of straw at 12s. per ton.						Total cost	..	..	..	..	172 4 0	..
Carting straw to station	10	16	16 0 0	2	32	7 9	12 0 0	..	..	4 0 0	309	2 0¼	32 0 0	..
Loading straw on trucks		Contract work at 2s. per truck		..	..	..	Total cost	..	..	..	..	..	4 16 9	..
Cost of sacks and sewing twine	..	2,617 standard sacks at 7s. per dozen, £76 6s. 7d.; sewing twine, £1 10s.								..	Total	..	77 16 7	596 6 10
Stripping	3	4	1 4 0	1	4	0 10 0	2 0 0	..	0 6 6	0 12 0	24	3 5	4 2 0	..
Winnowing	..	..	..	2	4	0 9 0	3 12 0	..	0 2 0	0 8 0	24	3 5	4 2 0	..
Carting wheat to store	15	1	1 2 6	4	3	0 7 6	1 2 6	..	..	0 3 9	24	2 0¼	2 8 9	..
Cost of sacks and sewing twine	..	204 standard sacks, at 7s. per dozen, £5 13s.; sewing twine, 2s. 6d.								..	..	..	6 1 6	14 14 3
		Temporary improvements, £1 11s. 6d.; rent on land £207								..	..	..	211 11 6	211 11 6
		Grand Total Cost of Harvesting under normal conditions								..	..	..	..	832 1 7

COST OF PRODUCTION OF WHEAT.

BALANCE-SHEET FOR NORMAL CONDITIONS.

Dr.	*Cost.*	*Profit.*	*Cr.*	*Value of Produce.*	*Totals.*
	£ s. d.	£ s. d.		£ s. d.	£ s. d.
Hay from Headlands.					
Cost of production of hay in stack under normal conditions. (For details see Tables No. 3 and 4)	30 16 7½		Valuation of hay in stack under normal conditions in November -26 tons at £2 5s. per ton	58 10 0	58 10 0
By credit balance net profit ..	..	27 13 4½			
Wheat and Straw from Threshing.			*Normal Valuations of Wheat and Baled Straw.*		
Cost of production of 309 acres of wheat and straw under normal conditions. (For details see Tables No. 3 and 4) ..	1,146 18 9½		7,171 bushels of wheat, firsts, at 3s. 4d. per bushel	1,195 3 4	
By credit balance net profit ..	..	641 7 9½	683 bushels of wheat, seconds, at 2s. 9d. per bushel	93 18 3	
			287 tons of straw, baled, on trucks at Werribee, at 35s. per ton	502 5 0	1,791 6 7
Wheat Harvested by Stripper and Winnowed.			*Normal Values of Wheat on Farm.*		
Cost of production of 24 acres of wheat under normal conditions. (For details see Tables No. 3 and 4)	57 9 6		558¼ bushels of wheat, firsts, at 3s. 4d. per bushel	93 2 3	
By credit balance net profit ..	..	42 19 5	53¾ bushels of wheat, seconds, at 2s. 9d. per bushel	7 6 8	100 8 11
Total cost of production from 345 acres normally	1,235 4 11				
Net profit procurable from 345 acres normally	..	715 0 7			
Total	£1,950 5 6		Total value of produce ..	..	1,950 5 6

Tables 3 and 4 and balance-sheet set out the cost and the returns from this field with commodities at their normal level of values.

The seeding of this paddock was carried out at a time when horse-feed was at famine prices, and at harvest the prices both of fodder and straw were considerably beyond normal values. Consequently the tables have been drawn to show what would be the cost of production under average conditions.

The cost of horses has been allowed for at 2s. per day, which is the normal cost of maintaining a working horse at the farm, and allowing for depreciation, interest on outlay, and idle days.

Labour has been charged at the current rates prevailing in the district, namely, 7s. to 8s. per day at seed-time, and 9s. to 10s. per day at harvest.

Standard cornsacks and binder twine have been reckoned at the average price ruling for the past few years.

Wheat has been taken at its normal value, namely, 3s. 4d. per bushel for f.a.q. quality and 2s. 9d. per bushel for seconds.

The past season, on which these returns have been based, although a yield of 27 bushels per acre was realized, cannot be considered exceptionally good, because of the fact that the rainfall for the whole year was 15.55 inches, or 5 inches below the average; and the fall during the growing period of the crop, namely, May to November, was 10.84 inches, as compared with the average fall during the same period for 42 years of 12.10 inches.

It will be seen that a wheat farmer who exercises ordinary care and economy and who attends consistently to the thorough cultivation of his soil, liberal manuring of the crop, and judicious selection of his seed, can assure himself of a good return on his capital and industry in a normal season.

AGRICULTURAL ITEMS.

Influenza, a catarrhal disease, affects horses from time to time. It is known as pink eye on the American continent. It is generally deemed an infectious ailment, but is as erratic in its departure as it is sudden in its intrusion into a stud.

Fighting sheep are kept by the native princes in India. These rams are generally white, with a trace of brown on the head and feet. The nose is arched and the horns large and massive, projecting in spiral form about the head. The tail measures about 4 inches in length.

The more systematically either arable or pasture land is ridged and furrowed, the more rapid is the process of weathering, and the larger the quantity of food made and liberated for the use of plants; hence the soil maker has to adopt methods of draining and soaking the sub-material to a greater depth than takes place under natural conditions.

The shape of the udder is a valuable indication of milking capacity when considered in conjunction with manual examination. The fleshy vessel is soon discovered, and where the fleshiness is pronounced it almost certainly indicates lack of milking qualities. The vessel that has a good "fall" and is level rather than pendulous is the type of udder that dairymen like.

Deep-rooting crops are soil factors of the highest value, and many weeds, notably thistles, mallows, and other subjects, which make piped roots and cavities in the soil, are by no means a misfortune where soil is at all shallow, or excessively heated and dry in summer. In many quarters, the roots of weeds will be found to be the only disrupting and deepening soil factors.

Good farmers improve their land; bad farmers impoverish it. The man who makes soil, makes money, and he who increases his banking account at the expense of his farm is a false economist. The soil is ever the medium, and if it can be made a safe medium of profit for a thousand years, it will return an infinitely higher reward than where a "take-all" or exploitation policy is pursued.

Probably the best sweetener of pasture-land is lime. In one form or another lime checks acidity, develops sweetness, and brings back much clover whose presence may not be suspected. Foggy pastures benefit greatly by liming. The methods of applying lime are many. There is the ordinary ground lime, which is often difficult to get locally. Lime-stone ground is very useful, and experiments have shown that it is little inferior to the burnt stone. Then in basic slag there is a certain element of lime, which accounts for slagging largely superseding the old practice of liming.

The manure pit should be planned on a tonnage basis, since, according to the class of land and kind of farm to be worked, it will demand a definite quantity of bulk manure per acre. Under ordinary conditions of feeding and housing, pigs yield more manure than any other animal, but the manure supply of the farm depends, not so much on the number of animals raised, as the care and provision made in accumulating and conserving it. It is to this neglect of our homestead manure supply that we must attribute so many depleted areas, which, under more intelligent management, would have improved rather than declined in value

The roots of crops, manure of any kind, old surface soil, water, and air are the true soil-making factors, and when these penetrate to the subsoil, or the subsoil is mixed through them, then the true "weathering" takes place, and more soil is made. To work poor and bare soil to any depth is, therefore, of little or no value. Let us say that it is always wrong to plough a bare fallow, in so far as we desire to make more soil, since no addition is made, and little or no change of importance takes place in the soil. It is looser, sweeter, and more acceptable to a given crop, but an exhaustive process all the same, whereas every crop should compensate in some form or other for what it takes from the soil.—*Auckland Weekly Times.*

WHAT SHALL WE DO WITH OUR LUCERNE?

R. T. Archer, Senior Dairy Inspector.

In discussing means of obtaining satisfactory returns for lucerne on irrigation settlements, the impression appears abroad that the present price of dairy cows is prohibitive. If that were so, how could the British farmer afford to conduct a dairy farm at all, for the regular price for a dairy stock there is always about equal to the prices ruling here this season. As will be seen from the table given below, the dairy farmer in England does not receive higher rates for produce of good quality on an average than the farmer in this country, be it milk, butter, or cheese. Also our herd testing experience leads us to the opinion that our cattle are capable of as good returns as those of Britain or other countries when well fed. That is where the difference lies. In Britain the cows are well fed the year round. Here they generally have sufficient feed while there is abundance of spring grass, but as soon as that becomes short or dry, and as substitutes or supplementary feeds are not provided, the cows dry off, consequently the returns are profitable for five or six months only. Dairy cows have now arrived at a fair valuation, and it should be an inducement to those farmers who own them to pay more attention to improvement in breeding and management. In the past, it has been generally conceded that £7 10s. per annum would cover the cost of keeping a cow, including food, interest, labour, &c. To this must now be added interest and sinking fund on increased cost of purchase, which will probably be £15. Allowing 5 per cent. interest = 15s., and 20 per cent. sinking fund = £3, making annual cost £11 5s. A herd of such cows would easily average 300 lbs. of fat, which at 1s. would return £15. Skim milk would amount to about 5,400 lbs. As 30 lbs. of skim milk will produce 1 lb. of pork, there would be 180 lbs. of pork per cow, valuing this at 6d. would give £4 10s. (present and probable future price for some years will be 50 per cent. above that). At this rate the total gross return per cow would be £19 10s., or net £8 5s., besides the calf. One acre of lucerne should provide sufficient feed for a cow for a year (*i.e.*, 5 cuts of 1 ton of hay each, equal to 3 tons green stuff, or 15 tons for the year of green lucerne); that would give a return equal to £19 per acre for lucerne converted into milk.

With regard to heifers, it has been found to cost at least £6 per head to rear to two years old, when they will usually drop their first calf, but very rarely could anything like that amount be obtained for them, so that instead of showing a profit they were sold at an absolute loss, consequently there was no inducement to rear. Now these heifers will bring £12 to £15 per head, and so will pay well to rear. I notice in the *Age*, of 1st March, a statement by the Hon. the Minister of Water Supply, to the effect that a farmer at Cohuna realized an average return per cow of £19 per head, so the foregoing is not an exaggeration. Cheese makers in the Western District have for years past made somewhere about that figure.

In conjunction with the dairy, for satisfactory results, the pig is almost indispensable, and while 30 lbs. of skim milk will produce 1 lb. of pork, when combined with grain feed or mill offal the return is enormously increased. The addition of lucerne chaff, or better still lucerne meal as produced by the Kelly Duplex, or similar mill, is also very beneficial from an economic point of view. When lucerne is ground into meal it is practically equal to pollard or other meal pound for pound. It is found that 40 lbs. of green or 15 lbs. of dry lucerne will produce 1 lb. of pork. So that one acre of green lucerne, equal to 15 tons, should produce 840 lbs. of pork. This at 6d. per lb. is equal to £21. When the pig industry has developed, however, we shall have to depend upon export values, which are ruled by the London market, so that we should reckon on about 4d. per lb., which would work out at about £14 per acre. Of course, it must not be assumed that this return will be obtained by feeding lucerne alone, but in conjunction with other food, such as skim milk and grain. It has been found that lucerne, like clover, has an increased value through being rich comparatively in mineral matter, such as phosphate of lime, especially in the case of young animals, as growing pigs. A plentiful supply of phosphate of lime whether in the food naturally or added in the form of bone meal, reduces the cost of production very considerably, by enabling the animals to digest and assimilate a bigger percentage of the food they consume.

It must not be expected that these good results are likely to be obtained by novices, but they can be and are being obtained by those who understand the management of stock. The high prices now ruling should increase the interest in herd testing, for a dairyman would be safer in paying a good price for a cow that, by the test, has proved a good producer. Very frequently the finest looking cow is absolutely unprofitable when her capacity for production is ascertained.

It must ever be borne in mind that a cow must have all she can eat if she is to produce her maximum, and that then it takes about 60 per cent. of the food she eats to keep the body going, and it is only what she eats in excess of her bodily requirements that she can convert into milk. A very large number of cows in this country are unprofitable only because they do not receive sufficient feed.

The most primitive form of farming is to grow crops for sale to other people, who buy them to feed to stock for the purpose of making profit, which the grower might as easily obtain. Besides by feeding for the production of milk or meat, the crop is concentrated to from $\frac{1}{5}$ to $\frac{1}{10}$ the weight, thereby saving considerably in freight. Another point that is all important, but lost sight of, is that when selling the crop for

consumption off the farm the fertility of the soil is being continually depleted, also the mechanical condition is detrimentally affected through the decrease in the amount of organic matter or humus in the soil. Either animals' droppings or the systematic ploughing in of green crops appears to be the only practicable means of keeping this up to the normal.

Comparative Price of Stock, Feed, and Produce.

ENGLAND.

Week ending 5th January, 1916.

MIDWINTER.

COWS.

First grade springers, £26 to £32.
First grade springers in milk, with calf at foot, £26 10s. to £34 10s.

VEAL.

10¼d. per lb.

PIGS.

Pork (carcass, first quality), 10d. per lb.
Bacon (first quality), 9d. per lb.
Lard, 7¾d. per lb.

BUTTER.

Superfine, 1s. 8d.

CHEESE.

Finest Cheddar (matured), 11¼d.

MILK.

13½d. per Imperial gallon.

STOCK FEED.

Meadow Hay, average £6 per ton, 2,240 lbs.
Clover Hay, £7 4s.
Bran, £8 per 2,000 lbs.
Pollard, £8 per 2,000 lbs.
Barley, 5s. per 50 lbs.
Oats, 4s. 2d. per 40 lbs.
Oat hulls, £5 10s. per 2,240 lbs.
Swede turnips, 25s.
Rice meal, £9 5s. per 2,240 lbs.

VICTORIA.

Week ending 8th January, 1916.

MIDSUMMER.

COWS.

Springers (15th January), £12 to £26.

VEAL.

6¾d. per lb.

PIGS.

Pork (carcass, first quality), 1s. per lb.
Bacon (first quality), 1s. 2d. per lb.
Lard, 10½d. per lb.
Porkers, 45s. to 83s.
Small light baconers, 84s.
Prime heavy, £5 8s.
Choice farmers' lots, £5 8s.

BUTTER.

Superfine, 1s. 1d.

CHEESE.

Finest Cheddar, 1s. 4d. per lb.
Semi-matured, 1s. 1d. per lb.

MILK.

1s. per Imperial gallon.

STOCK FEED.

Oaten Hay, £3 10s.
Lucerne Hay, £3 10s.
Bran, £4 5s. per 2,000 lbs.
Pollard, £6 10s. per 2,000 lbs.
Barley, 2s. 2d. per 50 lbs.
Oats, 2s. 2d. per 40 lbs.

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-1916.

Commenced 15th April, 1915; concluded 14th April, 1916.

FINAL RESULTS.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE.

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.3.16	Totals. 15.3.16 to 14.4.16	Totals. Twelve months.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
38	White Leghorns ..	G. McDonnell	1,557	101	1,661	1
34	,, ..	H. McKenzie and Son ..	1,524	113	1,637	2
42	,, ..	W. M. Bayles	1,505	118	1,623	3
23	,, ..	Fulham Park	1,417	125	1,542	4
59	,, ..	W. G. Osburne	1,408	126	1,534	5
5	,, ..	J. J. West	1,412	112	1,524	6
8	,, ..	C. J. Jackson	1,425	91	1,516	7
2	,, ..	E. A. Lawson	1,451	42	1,493	8
54	,, ..	W. H. Clingin	1,379	104	1,483	9
30	,, ..	A. E. Silbereisen ..	1,388	81	1,469	10
19	,, ..	L. G. Broadbent ..	1,439	28	1,467	11
3	,, ..	J. H. Gill	1,363	103	1,466	12
28	,, ..	R. Lethbridge	1,380	82	1,462	13
16	,, ..	N. Burston	1,350	91	1,441	14
50	,, ..	John Hood	1,337	100	1,437	15
44	,, ..	Mrs. F. M. Oliver ..	1,316	107	1,423	16
39	,, ..	W. M. Sewell	1,332	82	1,414	17
6	,, ..	F. Doldissen	1,317	96	1,413	18
58	,, ..	Thirkell and Smith ..	1,312	99	1,411	19
18	,, ..	D. Adams	1,319	88	1,407	20
27	,, ..	J. A. Stahl	1,308	99	1,407	
9	,, ..	J. Schwabb	1,313	82	1,395	22
32	,, ..	F. Hodges	1,285	108	1,393	23
22	,, ..	S. Buscumb	1,286	106	1,392	24
7	,, ..	Marville Poultry Farm ..	1,356	29	1,385	25
11	,, ..	J. B. Brigden	1,313	67	1,380	26
4	,, (5 birds)	R. Hay	1,287	83	1,370	27
26	,, ..	A. Mowatt	1,287	81	1,368	28
13	,, ..	T. Hustler	1,282	76	1,358	29
20	,, ..	R. W. Pope	1,285	71	1,356	30
10	,, (5 birds)	A. E. Tuttlehy	1,273	81	1,354	31
43	,, ..	H. I. Merrick	1,268	82	1,350	32
15	,, ..	H. N. H. Mirams ..	1,278	71	1,349	33
21	,, (5 birds)	E. B. Harris	1,308	10	1,318	34
1	,, ..	Mrs. H. Stevenson ..	1,267	47	1,314	35
24	,, ..	Lysbeth Poultry Farm ..	1,252	63	1,315	36
55	,, ..	W. N. O'Mullane ..	1,212	101	1,313	
46	,, ..	R. Berry	1,188	107	1,295	38
33	,, (4 birds)	A. W. Hall	1,224	68	1,292	39
12	,, ..	G. Heyman	1,191	93	1,284	40
60	,, ..	H. C. Brock	1,205	76	1,281	41
41	,, ..	J. A. Donaldson ..	1,193	80	1,273	42
36	,, ..	Weldon Poultry Yards ..	1,221	51	1,272	43
49	,, (5 birds)	Bennett and Chapman ..	1,229	16	1,245	44
40	,, ..	C. C. Dunn	1,146	88	1,234	45
48	,, ..	C. J. Beatty	1,180	14	1,224	46
52	,, ..	A. A. Sandland	1,156	62	1,218	47
37	,, ..	A. Ross	1,132	84	1,216	48
53	,, (5 birds)	W. G. Swift	1,172	34	1,206	49
45	,, ..	South Yan Yean Poultry Farm	1,110	85	1,195	50
25	,, (5 birds)	Giddy and Son	1,166	24	1,190	51
47	,, ..	J. C. Armstrong	1,142	27	1,169	52
57	,, ..	B. Mitchell	1,075	63	1,138	53
14	,, (5 birds)	W. Flood	1,073	45	1,118	54
31	,, ..	L. McLean	1,053	15	1,068	55
56	,, (5 birds)	C. Hurst	985	59	1,044	56
		Total	71,632	4,268	75,900	

FIFTH VICTORIAN EGG-LAYING COMPETITION, 1915-16—*continued.*

Six Birds. Pen No.	Breeds.	Owner.	Totals. 15.4.15 to 14.3.16	15.3.16 to 14.4.16	Twelve months.	Position in Competition.
		LIGHT BREEDS.				
		DRY MASH.				
80	White Leghorns ..	W. H. Robbins	1,541	97	1,638	1
68	,, ..	H. McKenzie and Son ..	1,490	111	1,601	2
76	,, ..	A. A. Sandland	1,364	93	1,457	3
63	,, ..	A. H. Padman	1,355	90	1,445	4
79	,, ..	Lysbeth Poultry Farm ..	1,363	65	1,428	5
61	,, ..	Mrs. H. Stevenson ..	1,262	112	1,374	6
67	,, ..	C. C. Dunn	1,287	79	1,366	7
65	,, ..	Thirkell and Smith ..	1,267	88	1,355	8
62	,, ..	Benwerren Egg Farm ..	1,308	35	1,343	9
66	,, ..	E. A. Lawson	1,263	49	1,312	10
69	,, ..	E. MacBrown	1,264	41	1,305	11
72	,, ..	Mrs. E. Zimmerman ..	1,244	55	1,299	12
71	,, ..	Moritz Bros.	1,239	41	1,280	13
78	,, ..	H. Hanbury	1,203	74	1,277	14
73	,, ..	C. L. Lindrea	1,165	105	1,270	15
77	,, ..	South Yan Yean Poultry Farm	1,149	93	1,242	16
64	,, (2 birds)	W. M. Bayles	1,150	40	1,190	17
74	,, (5 birds)	J. H. Gill	970	43	1,013	18
75	,, ..	Fulham Park	937	32	969	19
		Total	23,821	1,343	25,164	
		HEAVY BREEDS.				
		WET MASH.				
86	Black Orpingtons ..	C. E. Graham	1,419	88	1,507	1
97	,, ..	Marville Poultry Farm ..	1,358	89	1,447	2
89	Rhode Island Reds ..	E. W. Hippe	1,308	115	1,423	3
85	Black Orpingtons ..	H. H. Pump	1,291	103	1,394	4
92	,, ..	J. Ogden	1,302	75	1,377	5
81	,, ..	Mrs. T. W. Pearce ..	1,275	88	1,363	6
93	,, (5 birds)	L. W. Parker	1,225	71	1,296	7
88	,, ..	J. McAllan	1,171	91	1,262	8
98	Faverolles ..	K. Courtenay	1,158	108	1,266	9
100	Black Orpingtons (5 birds)	J. H. Wright	1,179	48	1,227	10
87	,, ..	W. C. Spencer	1,152	53	1,205	11
84	,, ..	Cowan Bros.	1,161	41	1,202	12
90	,, (5 birds)	Oaklands Poultry Farm ..	1,125	64	1,189	13
91	,, ..	A. Greenhalgh	1,145	22	1,167	14
99	,, ..	L. McLean	1,136	36	1,172	15
95	Silver Wyandottes ..	W. H. Forsyth	1,046	63	1,109	16
83	Black Orpingtons ..	G. Mayberry	953	31	984	17
94	Black Orpingtons (5 birds)	D. Fisher	966	12	978	18
82	White Wyandottes (5 birds)	J. B. Brigden	756	64	820	19
96	White Orpingtons ..	Stranks Bros.	654	33	687	20
		Total	22,760	1,295	24,055	

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

INSECT PESTS OF THE FRUIT, FLOWER, AND VEGETABLE GARDEN.

AND HOW TO TREAT THEM.

By C. French, Jnr., Government Entomologist.

(Continued from page 218.)

THE GREEN PEACH APHIS.

This is larger than the black peach aphis. It appears later in the season, and attacks the shoots and leaves. The leaves are frequently blistered, so that they look as if distorted by the peach curl fungus. In these blisters dozens of the aphides may be seen in different forms. Like most of the insects of the same order, it breeds very rapidly; so that there are a number of broods before midsummer, at which time the survivors go underground and fasten on to the roots. The females of the black peach aphis deposit their eggs—which are small, oval, and of a shiny black colour—in the crevices of the tree, behind the buds, &c. While the trees are dormant, spray with lime and sulphur wash, or red oil. Quassia chips are frequently used with beneficial results. When the leaves are on the trees, spray with tobacco water, which is made as follows: Steep 1 lb. tobacco in 1 gallon of hot water, and allow it to soak for 24 hours. Boil 1 lb. of soap in 1 gallon of water until the soap is dissolved; strain the tobacco water into the soap water; stir well, and make up to 5 or 6 gallons. Use waste stems of tobacco.

Fig. 6.—Green Peach Aphis (*Myzus*, Sp.).

THE CHERRY GREEN BEETLE.

This is a beautiful green beetle, about one-third of an inch in length. It is a native of Victoria, and formerly fed on the leaves of the various ti- or tea trees at Caulfield, Warburton, Cheltenham, and other locali-

ties near Melbourne. It appears about November, and is often to be found in millions swarming over the trees attacked. Unfortunately, during the last few years, it has forsaken its native food, and is doing great damage to all kinds of fruit and garden plants, roses especially being destroyed. Not only are the young buds destroyed, but the epidermis is completely eaten off the leaves; rose bushes then look

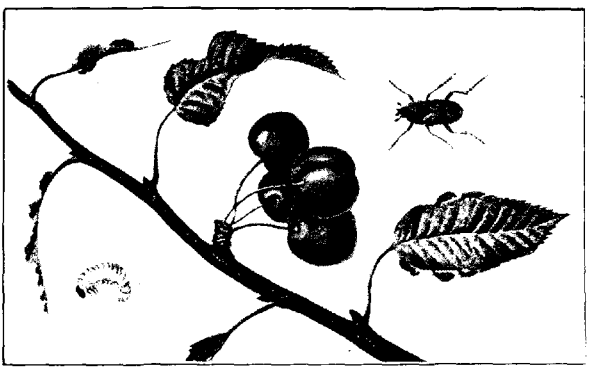


Fig. 7.—The Cherry Green Beetle (*Diplocephala colaspidoides*, Gyll.).

Fig. 8.—The Cottony-cushion Scale (*Icerya Purchasi*, Maskell).

as if a fire had scorched them. During the past season, these insects have been playing havoc with cherries, peaches, raspberries, and other small fruits. Sometimes they occur in countless numbers in cherry orchards near Melbourne, and are blown out to sea by the north winds, and drowned. Large numbers are found on the foreshores around the

Bay washed up by the waves. When they appear in a garden, smudge fires should be tried. Spray trees with arsenate of lead before the fruit ripens.

THE COTTONY-CUSHION SCALE.

This is a well-known pest on orange, lemon, acacia (wattles), pittosporum and other trees, also many garden plants. The fully-matured females are easily distinguished by the large, white, fluted, cottony egg masses at the posterior end of the red, yellow, or dark-brown bodies—which together are from ¼ to ½ in. long, and three-fourths as wide. The eggs are deposited within the cottony masses, and are oblong, and a rich cardinal red. From 400 to 1,000 may be laid by a single female. The young are bright red. The males are small, two-winged, red-bodied insects, with long antennæ. The large cottony masses are the egg-sacs of the females. The majority of the members of the (Coccidæ) "Scale Insects" have the ability to produce a scale-like covering, from which the common name is derived; while some, unable to form a scale, have the epidermis hardened into a thick, hard, chitinous wall; and still others secrete an abundance of white, powdery, or cotton-like wax as a covering. They feed by inserting into the tissues of the plants their small beaks or mouth parts, and sucking the juices. As a consequence of their great numbers, and the removal of a large amount of juices, the plants become weakened.

Fig. 9.—The Oleander Scale (*Aspidiotus Nerii*, Bouche).

This scale was at one time one of the worst insect pests of citrus trees in California; but, through the introduction of our Australian ladybird beetles into California, they have practically wiped the scales out. In Victoria, the red oil, lime and sulphur, and kesosene emulsion sprays are used against these insects.

THE OLEANDER OR IVY SCALE.

This species is rather a common greenhouse and garden pest, and not infrequently it causes considerable damage to palms, ivy, orchids, aspidistrias, and many other plants, fruit trees, and shrubs. Plants

attacked by this scale may be recognised by the yellowish-white, irregular patches of scale insects. The conditions in the greenhouse usually permit this insect to breed continuously, so that there is no demarcation of broods. Adult females, half-grown individuals, and crawling young can usually be found at almost any time. This pest is an introduction from Europe, where its attacks on garden plants are very severe. In some gardens this scale is destroyed by small wasps. During the last few years, the red oil sprays have been used for scale insects of all kinds, and the results have been most satisfactory. For deciduous fruit trees, apples, pears, &c., in winter, when buds are dormant, spray with red oil, 1 in 20; or in spring, when the buds are bursting, use 1 in 30. For ornamental trees and plants, spray in winter, when buds are dormant, 1 in 20. For palms, for scale insects, spray during spring or autumn. Plants growing outdoor, 1 in 30; in the greenhouse, spray on bright day with this spray, 1 in 40. Lime and sulphur is also used as a winter spray for scale insects.

(To be continued.)

ORCHARD AND GARDEN NOTES.

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The Orchard.

Cultivation.

Cultivation work should be well on the way by this time. The ploughing should be advanced, so as to leave plenty of time for other orchard work. The autumn ploughing may be as rough as possible, taking care to plough to the trees, so that the drainage furrow is left between the rows.

Manuring.

It is just possible, where heavy crops have been carried, that a top dressing of stable manure will be required to add humus to the soil. The fertility of the soil must be maintained; and, although stable and chemical manures as a general rule are of undoubted value as tree stimulants, well-cultivated and thoroughly tilled land will always carry fair crops, and with far less manure than otherwise. Also, if the orchard land is well and thoroughly drained, cultivated, and sub-soiled, any manures that are used will be far more beneficial to the trees. The more suitable conditions that are given to the trees, the better they can appreciate and assimilate their food.

Perhaps the most useful and valuable of manures is stable manure. It is of great use, not only as a manure and as an introducer of necessary bacteria into the soil, but its value in adding humus to the soil is

incalculable. Organic matter, such as stable manure, introduced into the soil quickly becomes humus; this greatly ameliorates and improves soil conditions. It is impossible to say what quantity of stable manure is necessary per acre; that alone can be determined by each circumstance. Orchards in different climates and in different soils will require differing quantities. A too liberal use of stable manure will be over-stimulating in most cases; while an excess beyond what is necessary for present use will only be waste, as humus is readily lost from the soil, once it is in an available food form.

It has been pointed out in these notes previously that an improved physical condition is far more profitable to the fruit-grower than the continued use of manures. A tree will be far more productive if it is happy in its soil conditions; uncomfortable conditions will always result in unprosperous trees.

A dressing of lime, using about 4 or 5 cwt. per acre, is of great value in stiff or heavy orchard lands; and it may be given at this season. The lime, which must be fresh, should be distributed in small heaps between the trees, covered with a layer of soil, and allowed to remain for a few days before ploughing or harrowing in.

PESTS.

The advice given last month for spraying should be followed, particularly where any oil emulsions or washes are to be used.

Orchards will benefit if an attack is now made upon the Codlin moth. All hiding places, nooks, and crannies, where the larvæ have hidden, should be thoroughly searched and cleaned out. The orchardist has far more time now to do this work than he will have in the spring time.

GENERAL WORK.

Drainage systems should now be extended with as little loss of time as possible.

New planting areas should be prepared, and subsoiled or trenched wherever possible.

The Vegetable Garden.

Weeds must be kept down in the vegetable garden. Weeds are generally free growing at this season; their growth is very insidious, and they will crowd out the young seedlings or plants in a very quick time. Hoeing and hand weeding must be resorted to, preferably hoeing. The frequent use of the hoe in winter time is of much benefit in the vegetable garden. A varied assortment of crops is now being produced; and if these can be kept growing much better crops will result. The soil quickly stagnates in the winter, and the only way to prevent this is to keep the surface stirred. Thus, a double service is performed with the aid of the hoe.

The application of lime is of great necessity at this season. In addition to amending unhealthy and unsuitable soil conditions, lime is particularly useful as an insecticide. It assists in destroying both eggs and insects in immense numbers, that would breed and live in the ground ready to do damage to all classes of vegetable crops. Therefore, wherever possible, the soil should receive an application of lime. The

garden should, as well, be manured with stable manure, but not for some weeks after the lime application.

Cabbage and cauliflower plants may be planted out; and seeds of parsnips, carrots, onions, peas, and broad beans may be sown.

The Flower Garden.

The whole flower section should now be thoroughly dug over. All beds should be cleaned up, top-dressed with manure, and well dug. The light rubbish, such as foliage, twiggy growths, weeds, &c., may all be dug in, and they will thus form a useful addition to the soil. These should never be wasted. Only the coarser and stouter growths should be carted away for burning, and then the ashes may be used as manure. No part, whatever, of garden rubbish or litter need be wasted. In one form or another it should be replaced in the soil.

May is a good month for establishing new gardens, and for planting out. All deciduous plants and shrubs may now be planted. It is not necessary to dig a deep hole for planting. A hole in which the roots of the plant can be comfortably arranged, without crowding or cramping, will be quite sufficient for the purpose.

Continue to sow seeds of hardy annuals, including sweet peas, although the main crop of sweet peas should be well above ground. Where there has been any overplanting, the young plants will readily stand transplanting, and this will greatly assist those that are to remain. Annuals should not be crowded in the beds. They require ample room for suitable development, and thus the seeds should be sown thinly or the plants set out a good distance from each other.

All herbaceous perennials that have finished blooming may now be cut down. Included amongst these are phlox, delphiniums, &c. If these are to remain in their present situation for another season it is always an advantage to raise them somewhat, by slightly lifting them with a fork, so that too much water will not settle around the crowns: they may also be mulched with stable manure, or the manure may be forked into the soil around the crowns.

REMINDERS FOR JUNE.

LIVE STOCK.

HORSES.—Those stabled and in regular work should be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley. Paddocked horses should be looked at from time to time to ascertain if they are doing satisfactorily.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed and aired in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. If in low condition feed well to tide them over the period and stimulate milk flow. Calves should be kept in warm dry shed. Cows and heifers for early autumn calving may be put to the bull.

SHEEP.—Clear muck-balls from tails and legs of all sheep. Have the wool cleared from round udders and eyes of all young lambing ewes, and see them first thing every morning. Mark the ram lambs at earliest chance. Cut off ewes with oldest wether lambs to best pasture or fodder crops.

Sheep with overgrown hoofs are unthrifty. Whenever noticed trim back into shape; they cut easily during winter. If left, are conducive to lameness, and even foot rot. In the case of common foot rot, or scald, the feet can be placed into a thick paste made of lime and boiling water. Obstinate cases of long standing may need more drastic remedies, and persistent attention. In all cases pare away all loose portions, and leave the diseased parts clearly exposed.

Foxes are more ravenous during winter months. Sparrows, starlings, and parrots are good bait. Poisoning lambs already killed usually accounts for scavenger foxes only, and in many cases innocent good dogs.

Every fox is not a lamb killer. Remove all lambs for two or three nights *if at all possible, and birds then will rarely fail to entice Reynard the second* or third night.

Powdered strychnine, just sufficient to cover nicely a threepenny-piece, is the usual dose.

POULTRY.—Supplies of shell grit and charcoal should always be available. Sow a mixture of English grass and clover: this not only removes taint in soil but provides excellent green fodder for stock. Where possible, lucerne and silver beet should now be sown for summer feed; liver (cooked) and maize aids to egg production during cold weather. Morning mash should be mixed with liver soup given to the birds warm in a crumbly condition. All yards should be drained to ensure comfort for the birds.

CULTIVATION.

FARM.—Plough potato land. Land to be sown later on with potatoes, mangolds, maize, and millet should be manured and well worked. Sow malting barley and finish sowing of cereals. Lift and store mangolds, turnips, &c. Clean out drains and water furrows. Clean up and stack manure in heaps protected from the weather.

ORCHARD.—Finish ploughing; plant young trees; spray with red oil or petroleum for scales, mites, aphis, &c.; carry out drainage system; clean out drains; commence pruning.

VEGETABLE GARDEN.—Prepare beds for crops; cultivate deeply; practise rotation in planting out; renovate asparagus beds; plant out all seedlings; sow radish, peas, broad beans, leeks, spinach, lettuce, carrot, &c.; plant rhubarb.

FLOWER GARDEN.—Continue digging and manuring; dig all weeds and leafy growths; plant out shrubs, roses, &c.; plant rose cuttings; prune deciduous trees and shrubs; sow sweet peas and plant out seedlings.

VINEYARD.—Thoroughly prepare for plantation, land already subsoiled for the purpose. Remember that the freer it is kept from weeds from this forward, the less trouble will there be from cut-worms next spring. Applications for ungrafted resistant rootlings and cuttings must be made before the end of the month—see **Journal** for February, 1916. Pruning and ploughing should be actively proceeded with. In northern districts plough to a depth of seven or eight inches. Manures should be applied as early as possible.

Cellar.—Rack all wines which have not been previously dealt with. Fortify sweet wines to full strength.